THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXII. No. 2086.] LONDON, MAY 5, 1903. [55TH YEAR. PRICE 6d.

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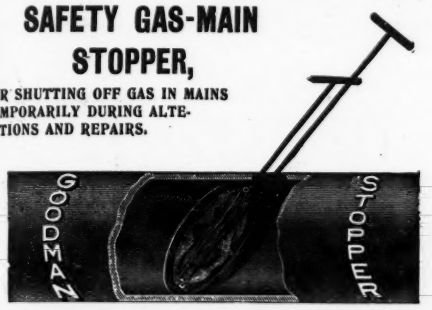

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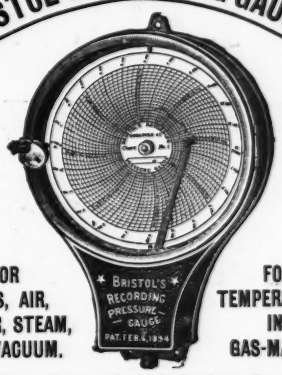

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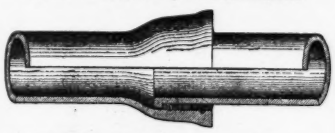

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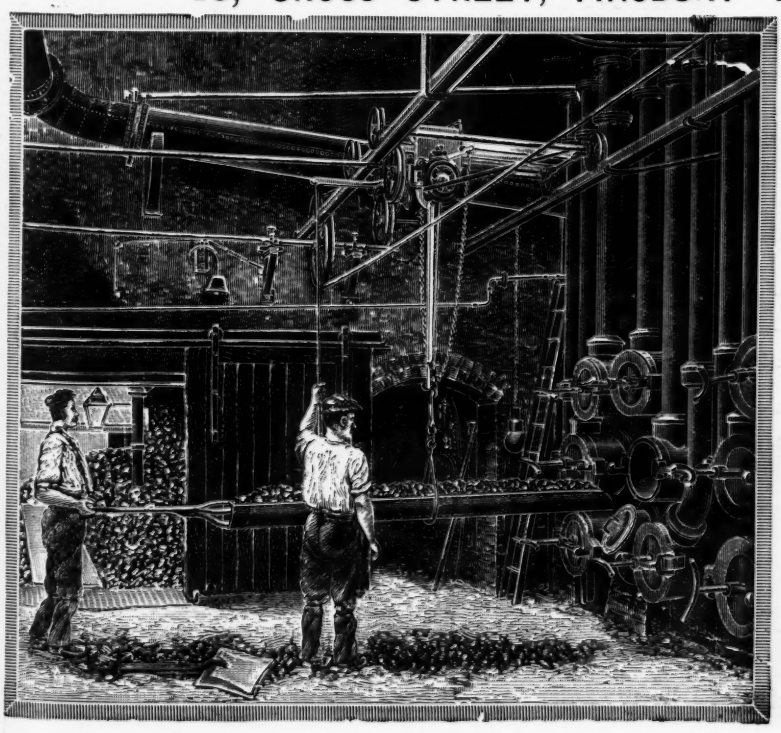

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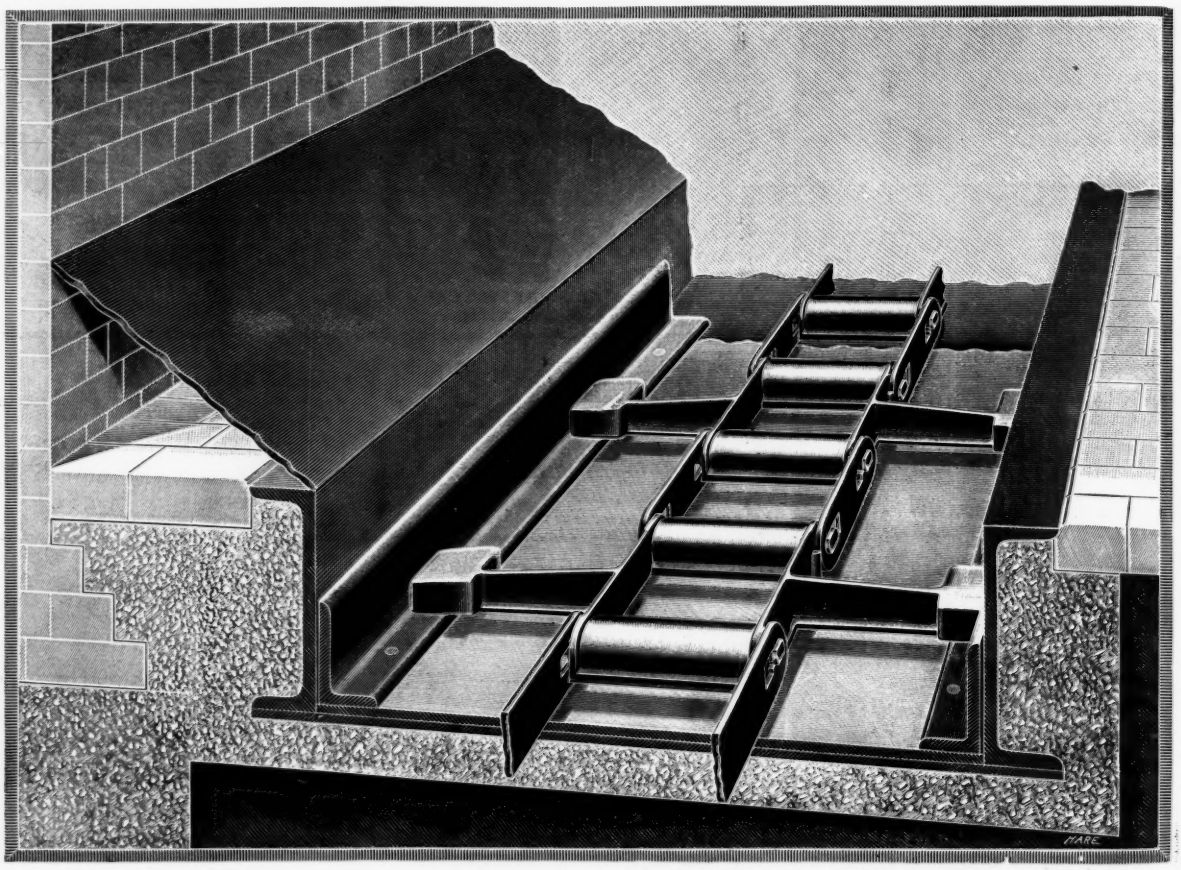

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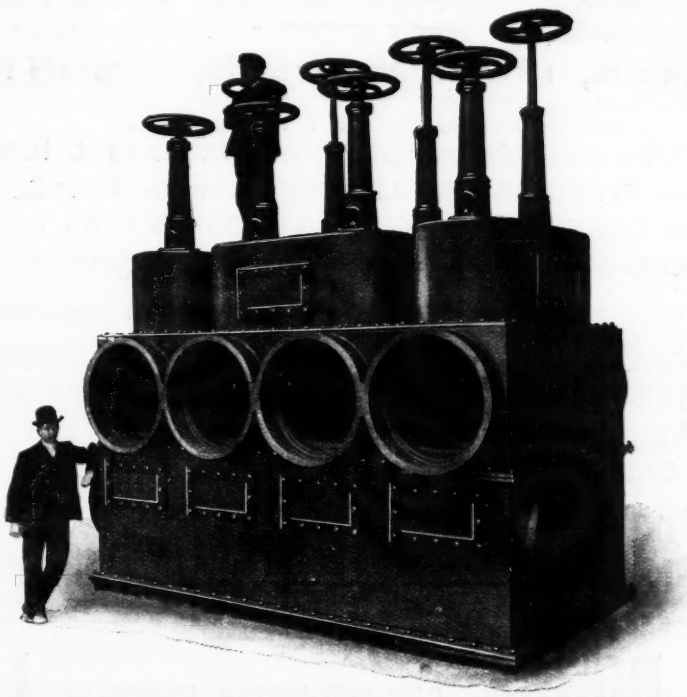

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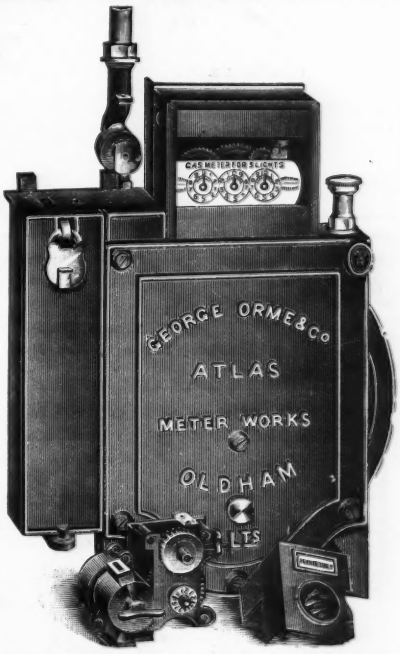

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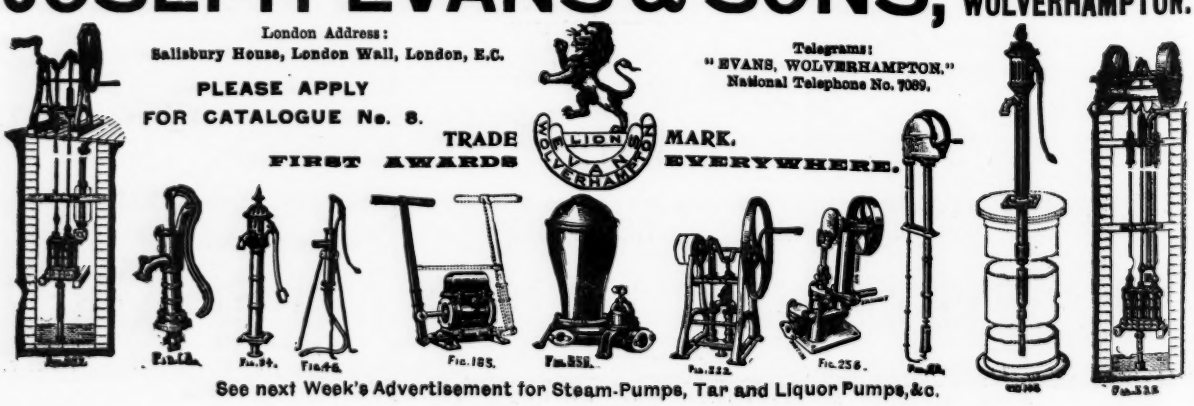

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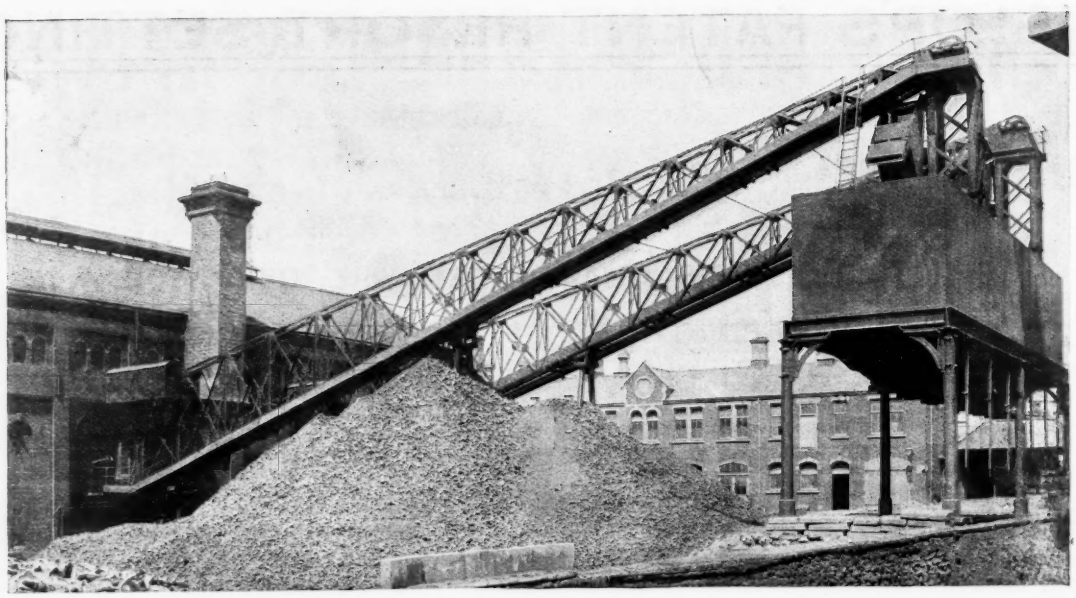

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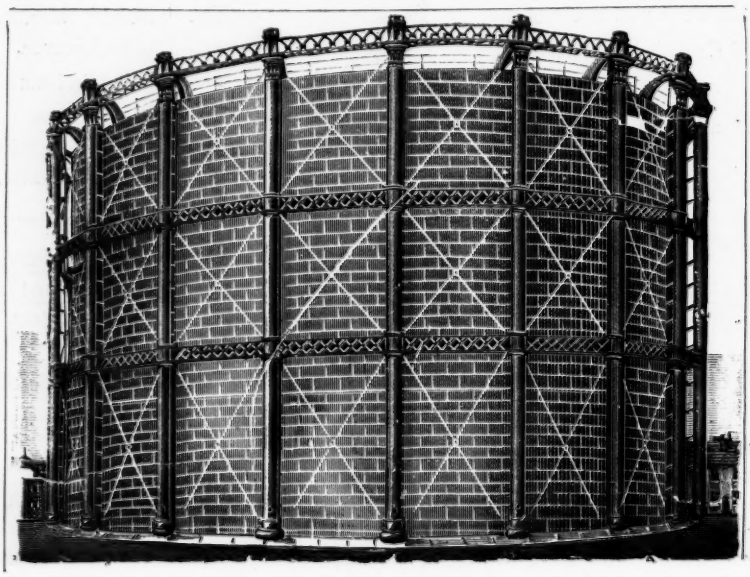

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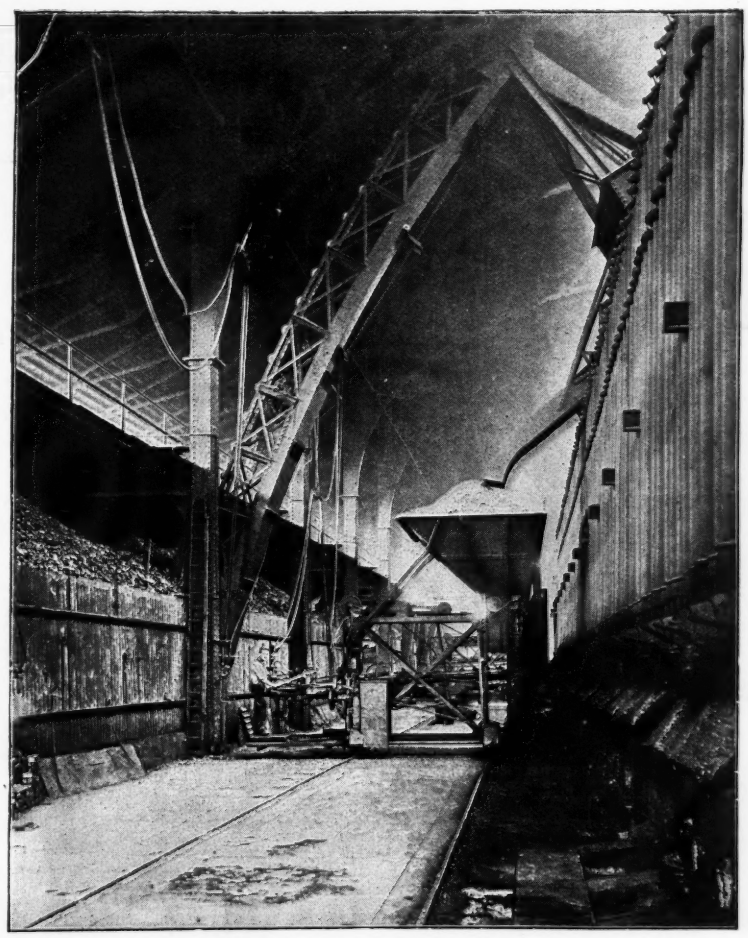

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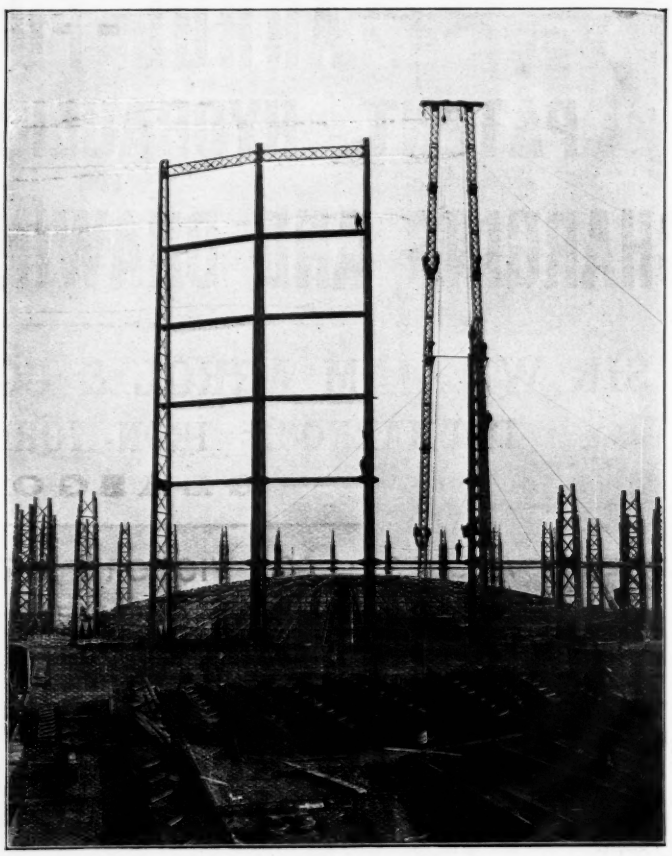

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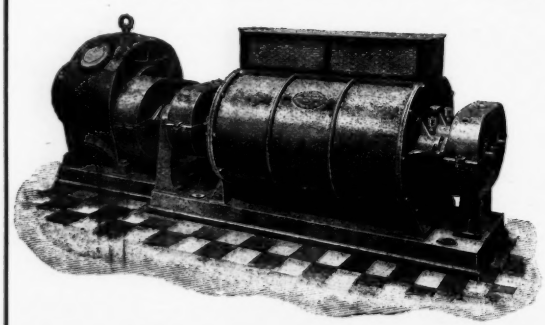

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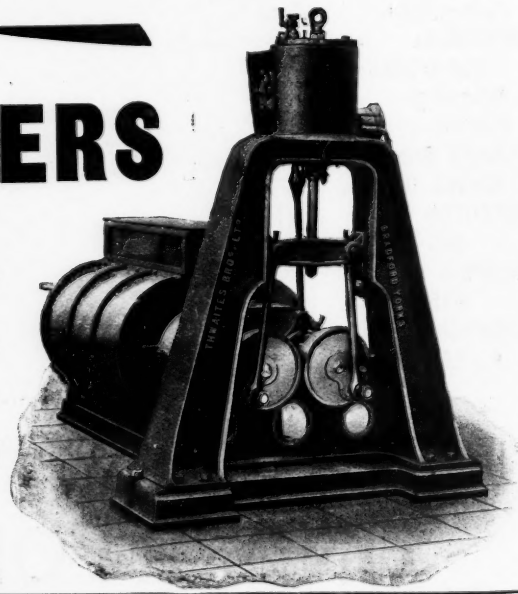

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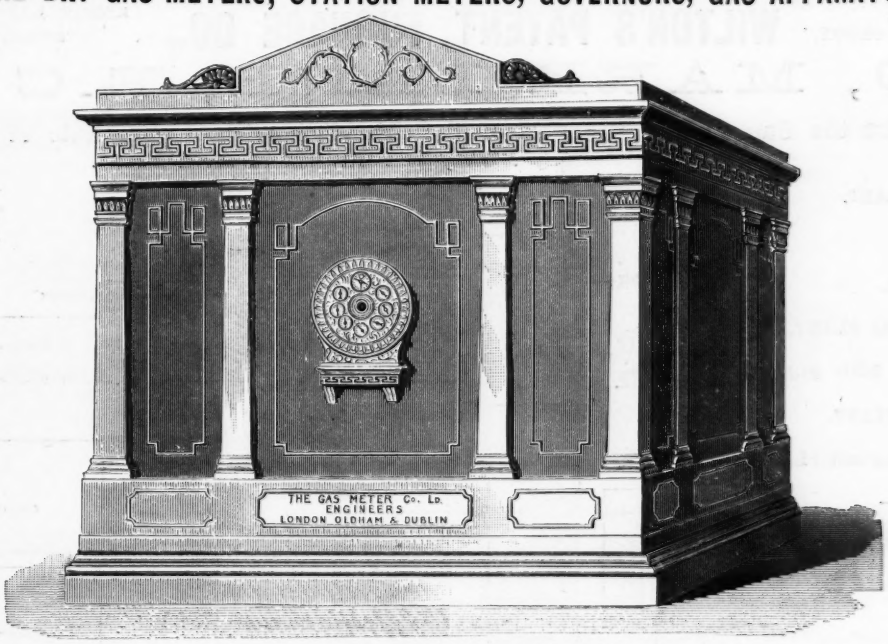

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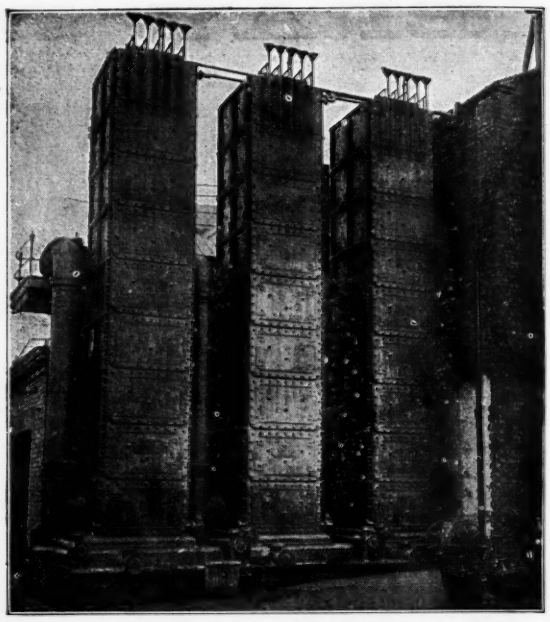

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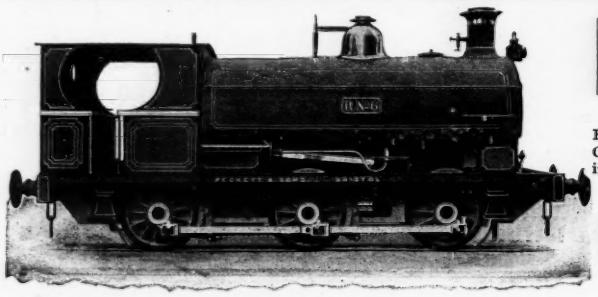

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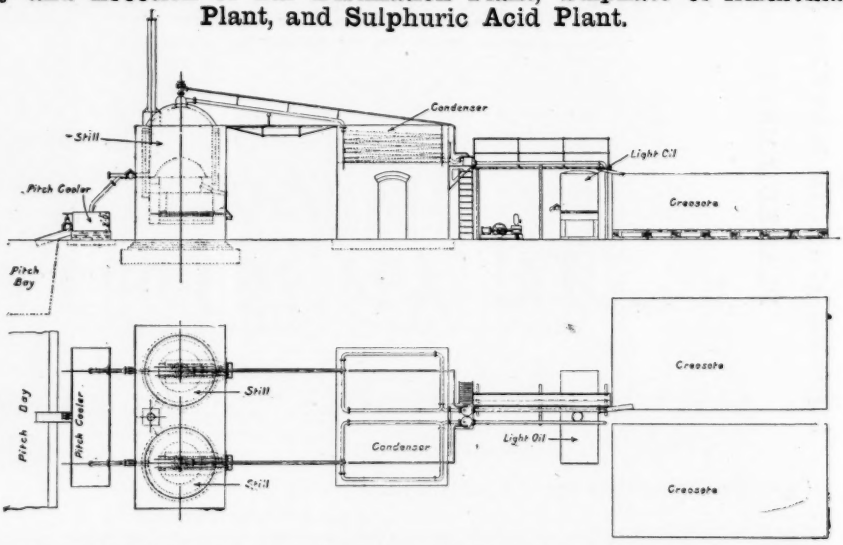

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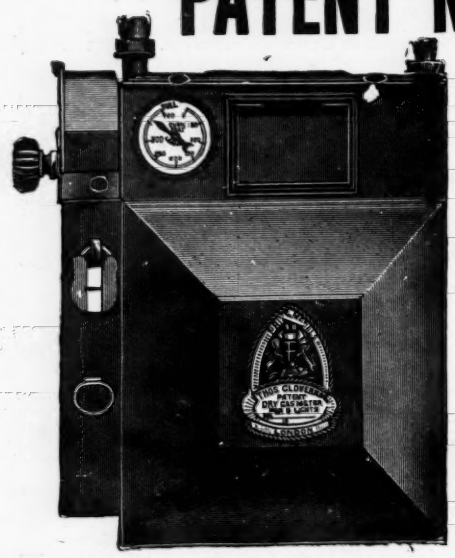

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EDITORIAL NOTES.

London Gas Bills in Parliament—Withdrawals and Settlements.

LAST week brought some very notable surprises for those who have been watching for the opening of the Metropolitan Gas Campaign in Parliament. The Select Committee presided over by Sir John Brunner, to which had been sent all the London Gas Companies' Bills, that of the Crystal Palace District Gas Company, and those of the London County Council, began their sittings on Tuesday. Before this day, rumours had spread of certain conferences having been held, and of settlements either effected or brought within the range of possibility; but, as usual, nobody knew precisely what was going to happen until the moment of the commencement of proceedings. Then, it transpired that the London County Council had dropped their various and sundry schemes against the London Gas Companies. It has already been remarked here that the County Council, having wantonly attacked all the London Gas Companies upon matters of the extremest technicality, and in a manner not too conspicuously honest, became frightened when the assailed "showed fight," and begged the Board of Trade to appoint a Departmental Committee to inquire into the questions raised. The Board arranged a meeting; and, having incidentally repulsed a London County Council attempt to make out that the Crystal Palace District Company was a Metropolitan concern, undertook that if all the parties to the pending London gas fight would hold their hands, a Departmental Committee should be told off to see what it was all about. This official complaisance suited the County Council exactly; for they had nothing to lose either way. It did not, however, satisfy the Gas Companies, whose cases, upon which they were prepared to take the judgment of Parliament, were all different. The South Metropolitan Company have no Bill; but they had cleared for action to resist the gratuitous proposal of the County Council to go back upon the terms of the Act of 1900. Their case was the easiest to dispose of, inasmuch as, if the County Council would only let them alone, they would subside into the normal state of quiescence.

The Commercial Company were in a straiter case; being promoters of a Bill to correct the remarkable aberration of the County Council and the Gas Referees in their regard, as already explained. The tardy repentance of the County Council could not, therefore, avail to prevent them from seeking their constitutional remedy. The advisers of the Company, having trusted the County Council last year, and been rewarded with a Gas Referees' prescription all to themselves, were not likely to be deluded again. Consequently, they were willing to be friends in council over the problems into which the Board of Trade were asked to inquire; but they wanted their Bill to go forward all the same. After some talk, this was conceded with the addition of some verbal limitations, which are meaningless, because Parliament can always revise its settlements. The case of the Gaslight and Coke Company was the most serious of all. They are in the exceptional position of being the objects of a formal attacking Bill, promoted by the London County Council, which would give the undertaking nothing in exchange for whatever it might be permitted by Parliament to take away. At the same time, the Company are promoting a Bill of their own, which recognizes the principle of *quid pro quo*. Primarily, the Company want capital, and must have it. There could be no paltering on this head. At the same time, it was clearly impossible for the Board of Trade and the London County Council to relegate to their Departmental Committee all those technical questions respecting illuminating power and so forth, which are of such great commercial significance, without arriving at an agreement as to what the Gaslight and Coke Company, like the Commercial Company, must have to go on with. It will be found, therefore, that after the Crystal Palace District Gas Bill is disposed of, Sir John Brunner's Committee will not have much contentious matter left to engage them.

The decision to investigate the questions of present-day gas-testing by a Departmental Committee of the Board of Trade is a welcome one, especially in the circumstances. No thanks are due to the London County Council for their consent in the matter, because they deliberately set themselves the task of employing their exceptional powers of parliamentary action to embarrass and burden the Gas Companies. If the Companies had backed down before the Council, opening their mouths and shutting their eyes, like good children, to everything the Council and the Referees chose to send them, their business would not have been worth carrying on. By taking it fighting, and carrying the war into the enemies' own country—attacking the competence of the Referees, and resisting the arrogance of the Council—the Gas Companies ultimately prevailed upon the Board of Trade so far as to bring the official mind to acknowledge that there might be more than one side to the questions at issue. Hence the Departmental Committee. It is reported that the Chairman of the Committee is to be Lord Rayleigh; and the nomination commands general approval. Nothing appears to have been settled as to who is to be associated with Lord Rayleigh in this investigation, or what form the inquiry is to take. There are all sorts of precedents which might be followed. The Committee may hear evidence, or undertake to collect their own information. If it is a representative Committee, comprising delegates from the various undertakings and bodies interested in the matter, it will probably follow the former course; but it is more probable that it will be a small working Committee of independent experts, who will report to the Board of Trade on their own labours. Then the Department might promote legislation on the lines of the report, which would leave it open to the Companies to take their own course. The objection we have expressed to the reference of the matter to such a Committee has been entirely removed by the arrangement by which the rights and interests of the Gas Companies have been safeguarded. So long as the Companies do not suffer hurt while the reference is being settled and dealt with, there can be no possible objection to any steps taken with the single purpose of ascertaining how in future the gas consumers of London can be assured of receiving the commodity they pay for.

The Bethesda Debate in the House of Commons.

THE "full-dress" debate in the House of Commons on the alleged neglect of duty on the part of the Board of Trade in keeping aloof from the Bethesda labour trouble came to a handsome end in an overwhelming defeat of the scratch forces of official Liberalism and Social Democracy. As we have already remarked in connection with the selection of this matter as the ground for the moving of a vote of want of confidence in the Government, the official opposition of the day seems to have travelled a long way from the Free Trade principles of the Manchester school. Unfortunately, the exchange that appears to have been made between Cobdenism and Social Democracy is no improvement in any sense. The case of Lord Penrhyn was expounded to the House by Colonel Bromley-Davenport; and by the time he had explained the nature, and the manners and customs of the notorious Quarry Committee which Lord Penrhyn had rejected, most of those who had hastily espoused the cause of the strikers must have wished they had displayed greater caution. Before the debate ended the emptiness of the attack on the Government, through Lord Penrhyn, was thoroughly exposed; and the imposture of "Bethesda martyrdom" was utterly demolished.

There is one particularly weak line of comment on these proceedings which sorely taxes one's patience to follow in the various newspapers that have for some months harboured it. It is that which describes Lord Penrhyn as a hard man, who, even if he is in the right, is unnecessarily inflexible

in asserting his position of mastery. Even the "Builder," which is usually sane in its judgments, remarks that the Bethesda dispute is "abnormal," and opines that "had the "employer been an ordinary man of business, he could not "have afforded to carry on this long contest with his work-"men." Unless this means that Lord Penrhyn's inflexibility is not "business," in the ordinary sense, the reflection has no meaning at all. But this attribute of sound business is precisely the leading characteristic of Lord Penrhyn's policy. Where there is a direct opposition of two forces, the greater must overcome the less. This is the only physical law that can be discerned in the processes of the Universe; and it is ridiculous to suppose the possibility of a middle course. So it is with the opposition of right and wrong. One of these is not always the stronger; but the stronger must prevail, whichever it is. There is no middle course.

If the "Builder" means that Lord Penrhyn's firmness, in acting upon a conception of his duty which no honest observer has ventured to question, is not like that "holding a "candle to the devil" which weaker men with their living to get, and commercial firms, often find themselves constrained to practise—then we agree, and are thankful that there are employers of labour who can afford to act so. The building trades supply a painful illustration of what follows upon time-serving and truckling to Trade Unions. It is as much as a foreman's life is worth to inquire too curiously how many bricks a Society man will condescend to lay in a day; and few masters dare to speak above a whisper to any plasterer in their employ. How many youths are learning the carpenter's trade in London? This terrible slackness all comes of letting things slide here, and taking no notice there. The master—so called by courtesy—dared not offend the men on a particular job, lest they might "line "up" at a moment's notice, and leave him in the lurch. So the mischief is spread and intensified. If this wretched tyranny—which is not, be it observed, manipulated in the interest of the best workmen—is ever to be broken, it will not be by employers who are fearful of any interruption of their business, but by men of the stamp of Lord Penrhyn, who believe it is better business to stamp out evil than to suffer it.

The Provisional Orders of Small Local Authorities.

Recently it was recorded in our "Electric Lighting Memo-"randa" that the Board of Trade had refused to grant Provisional Orders to the local authorities for the electric lighting of a couple of rural districts in South Wales; and it is only fair to register the fact that a leading electrical periodical—the "Electrical Review"—shares our opinion as to the desirability of the Board of Trade exercising a wise discretion in discountenancing questionable municipal adventures in this line. As was remarked in this connection, the prospect of Parliament being asked to impose the famous Bermondsey clause upon the promoters, in the event of the Board of Trade granting the Orders, probably availed to make the Department think twice about giving a consent which would a short time ago have been yielded almost as a matter of course. It is satisfactory to observe that the Local Government Board are becoming equally shy of the electric lighting ambitions of small district councils. In the case of East Barnet Valley, the refusal of the scheme was followed by the rejection, at the last election, of the Chairman and ten members of the old Council who were identified with it. It is also reported that the Irish Local Government Board have refused an electric lighting loan to Dungannon, on the ground that the proposed municipal trading is not justified in the circumstances of the locality. These instances are warmly approved of by our electrical contemporary, which is sufficiently well advised to perceive that the interest of the electric lighting industry is not advanced by the unnecessary multiplication of local undertakings which can never be anything else than a burden on the rates. The real cause of progress in local affairs would be vastly helped if all projects affecting the public interest were similarly treated in the newspapers—that is to say, on their merits—and not frantically applauded or howled down, as the case might be, simply because they happened to be of "municipal," or independent origin.

It is well observed, moreover, that this question of local enterprises is a very much larger one than any particular application of it. First and foremost, it is for the Government Departments concerned to remember and act consistently upon the spirit of the legal judgment in the Rickmansworth case, which brought out the fact that the representative character of local authorities is strictly limited. This fact, as we have remarked, such bodies, from the biggest to the smallest, are very apt to forget. We are continually being told by certain newspapers that "London's "Parliament" thinks this or that, and even that some parochial "Chancellor" has his fiscal policy. All this is nonsense; but it is pernicious nonsense, and therefore must be sharply discountenanced. The representative quality of local authorities is carefully limited by law, just as their powers are restricted to what is necessary for the carrying out of their statutory duties. Whenever any new departure from the established routine is proposed—such as the acquisition of fresh statutory powers, or parliamentary action of any kind—the business should be referred to the general body of owners and occupiers, who are the community for constitutional purposes, at the earliest possible moment, before any considerable costs are incurred. This is the true intent of the Borough Funds Act; and those who desire to do service to their town in an elective capacity, could not follow a better principle than in engaging to act in this sense. A hectoring Progressivism, as everybody knows, hates the Borough Funds Act. The want of something effective to the same end costs the people of London about £50,000 a year; this being a moderate estimate of the outlay on the parliamentary campaigns of the London County Council—mostly wholly unnecessary, uncalled for, and only provocative of costly oppositions from other parties. Such municipal corporations as those of Manchester, Liverpool, and Birmingham, occasionally offer spectacles of Town Hall arrogance; and this element always operates to reduce the Borough Funds Act to an empty form. The smaller local authorities follow the fashion; so that it is the commonest of proceedings on their part to incur expenses which have the effect of prejudicing the ratepayers' decision on questions which ought to be perfectly open. There is no valid excuse for this overriding of public rights.

It is suggested by our contemporary that if memorials to Government Departments requesting special powers or loans were always accompanied by evidence of the ratepayers' consent, this would at least establish the fact "that "a majority favoured the application." Unfortunately, this is not the case with the results of ratepayers' polls, which hardly ever number a majority of the electorate. What usually happens is that an organized minority, not always of the most respectable character, has its own way. It is difficult to suggest a perfectly satisfactory means of arriving at the balance of respectable public opinion in any but the smallest communities; but, meanwhile, it will be a great protection to the mass of the public if Parliamentary Committees and Government Departments will only take local authorities' views for what these may be worth, and not respect them for a presumed representative quality which they are often far from possessing.

The Technical Teaching of Apprentices.

The Works Manager of "Handysides," of Derby—Mr. Edward E. Matheson—has taken a leading part in helping the local technical college to be of the greatest possible use to the apprentices of the firm. His plan is that of raising the wages of the apprentices on their passing examinations; and he claims that the arrangement works so successfully that, as regards Derby, the question of technical education is in great part solved—the technical classes being full to overflowing with eager apprentices, who are naturally in the very best position for profiting by what they learn. An essential feature of Mr. Matheson's arrangement is that the lads are sent to the classes between the hours of eight and one o'clock. At this time of the day, the boys are able to take things more easily, and are quite fresh, which cannot be the case as regards evening classes. The best part of this arrangement, as it will strike most observers of the history of technical classes, is that it prevents the attendance of youths of the "pupil-teacher" variety, who are in the habit of taking so-called technical courses for the sake of obtaining teachers' certificates. This avidity of the wrong sort of students for evening instruction has been one of the great weaknesses of the system as hitherto carried out in teaching centres. It has been a matter of impossibility to ensure that the instruction imparted should reach the right

objects—really working lads. On the other hand, the difficulty has been to get such lads, after doing their full day's work, to attend classes for the same kind of thing in their spare time. One's sympathies in this matter were with the boys. The purpose of the present notice of Mr. Matheson's plan of dealing with both difficulties at once is to suggest to all the readers of these lines, whom the subject may concern, to do likewise by their youthful hands. Let the lads go to classes for technical instruction in the morning, with reasonable frequency. If necessary, the employers of any particular district could agree upon this expedient, so as to ensure full classes. In very large works, the classes could be held upon the premises. Then the evening instruction could be relegated to subjects that would offer a change of occupation to the lads, which would not hurt them. The idea is a grand one; and it behoves every employer of boys in good technical work to lend a hand in realizing it.

The Life of Retorts.

The little communication that Mr. W. R. Herring has made to the Edinburgh and Leith Gas Commissioners on the question of the duration of inclined and horizontal retorts is one which will perhaps create some astonishment among gas engineers, even as, it is believed, the result of the investigation surprised the reporter himself. The figures will be found on p. 290; and they raise a point upon which it will be of interest if other engineers will contribute their experience. We are under the impression that cases will be found that do not altogether bear out Mr. Herring's remarkable testimony as to the superior working life of inclines in comparison with horizontals; while there are others that will corroborate—Middleton, for instance. Take the best of the two sets of duration figures given in the table for horizontals —354 days, and compare it with the inclines; and it is found that the life of the latter has exceeded the horizontals by 428 days, and yet are "still in working order." This remarkable span of life of the one over the other is not due to lessened use—on the contrary, the coal carbonized per 20 feet run of retort has in the case of the inclines nearly doubled the Edinburgh figures for horizontals. Yet, be it repeated, the former are still in working order. It may be submitted by critics that the Edinburgh (New Street) installation is only a small one, and is hardly a fair representation. To which the reply may be made that a large installation is only, as it were, an accumulation of a number of small ones. Granton is not a small installation; and, remarks Mr. Herring, there is nothing to show, after 180 days, that the settings will not be equally as satisfactory as those at New Street. However, experience of this kind must be taken into consideration in future criticisms as to the capital cost of one system over the other, and on the point of wear and tear.

A Periodical Record of Progress.

It has often occurred to us that a periodical epitome of technical progress in connection with large industries like that of gas manufacture and supply would be a very useful thing. The records as they were time after time completed would be valuable for refreshing memory, for reference, and for enabling the younger students to take a larger survey of the past than they would otherwise be able to do. Their contemporaneous value, too, would be transmitted to posterity. We must, therefore, felicitate our friends of the Ohio Gaslight Association on having been the first to institute a periodical review of advance of the kind. The idea was only mooted at their meeting last year. It was at once accepted; a "Progress Department" was formed; and Mr. Irvin Butterworth was selected to be the first reporter, with instructions to prepare a summary representation of the progress made in the last five years. The task was by no means an easy one—particularly so for the first man to undertake it. But Mr. Butterworth has acquitted himself well; and the foundation he has laid will greatly lighten the task of his successors, whose review, if this feature of the Association's work is continued, will hereafter cover only the previous year's progress. Although the report is intended to, and does, appeal more to American gas engineers than to British, we purpose publishing the main parts, as it is well at times to examine things through other people's spectacles. After reading the report, most readers will agree with Mr. Butterworth's prediction that it will prove a source of encouragement to any who feel that progress has been slow and invention indolent during the recent history of the gas business. It is shown that there has been more or less advance all along the line—touching practically every detail of the business—the aggregate effect of which has been to greatly increase the practical efficiency of gas plants and methods.

The Lines of Progress, and Carbonization Work.

The lines along which the reporter finds that progress has chiefly been made in the five years are in respect of gas-engines, high-power gas-lamps, the uses of gas for fuel, producer gas, low candle-power gas, high-pressure distribution, and bye-product coke-ovens. We think there is an omission in not including carbonization methods and retort-house machinery. In this branch of technical gas work, there is more life at the present time than in any other. The section of the report selected for publication this week treats of the progress that has been made in manufacturing methods and plant; and herein there seems to be an unexpressed admission that the wheel of progress in the adoption of modern methods of coal carbonization has not been revolving at a very rapid rate in America—not so rapidly as in this country and Europe. The opinion may be hazarded that water gas has been the retarding influence. But if we read aright, a reaction has set in. There are at least five firms now prepared to erect inclined retorts in America; in the construction of horizontal settings, the increase to "eight" in the number of retorts per bed has "suddenly become very popular;" and stoking machinery and coal and coke conveyors are receiving increased attention As to water gas, however, "there seems to have been no radical improvements made during the past five years." Altogether, we have found the report extremely interesting; and the thanks of his brethren are due to Mr. Butterworth for the evident care he has taken to secure a complete view of the technical progress made in the five years, and in condensing what he has seen (and his impressions) into such small compass. It may be that some small defects in the way of omission may be found; but the period and subject were both extensive, and the work new. Suggestion and not cavilling criticism will help in the perfection of future retrospects of the kind; and such suggestion the Ohio Gaslight Association will heartily welcome.

The Supply of Electrical Fittings by Corporations.

The case against the Barnstaple Corporation with regard to the supply and maintenance of private electric lighting installations has ended in a way which is only partially satisfactory. That is to say, the Corporation have "climbed down," without a judicial decision being given upon the question at issue. The case had aroused a good deal of interest on account of the desire recently shown by municipalities owning electricity undertakings to attract customers by means of house wiring and fitting on the instalment system; and the facts were indicated in the "JOURNAL" for March 17 (p. 689). The Corporation are working under a Provisional Order; and for them to succeed in the action, it would only have been necessary to show that their Order under the Electric Lighting Acts authorized them to spend money in the way objected to. This they made no effort whatever to do, but instead gave an undertaking not to do anything further in the direction complained of, except so far as they had already entered into contracts. The Judge before whom the matter came remarked that it was quite plain to him that the Corporation had been advised not to go on with the wiring business; but their Counsel said he did not think this was the case. However that may be, the question of whether municipalities working under an ordinary Electric Lighting Provisional Order are entitled to spend any of the money borrowed on the wiring of the consumers' premises has still to be definitely settled; and in all probability it will not be long before another attempt will be made to ascertain the opinion of the High Court on the point. In another part of to-day's number, we notice an offer made by an Electric Light Company to instal, through a local firm, six electric incandescent lights, free of charge, in any private house the minimum rental of which is not less than £25 per annum. This goes very far beyond anything contemplated by the Corporation of Barnstaple; but then, of course, there is all the difference in such matters between a company and a corporation. A company is created merely for the purpose of trading; and those who have

voluntarily embarked their money in the enterprise are the only ones to suffer if the business proves unremunerative. Will any of our "Progressive" friends tell us that municipalities have been created merely for the purpose of trading, and that any risk which a company might see fit to run must be equally justifiable in their case—where, in the event of the speculation turning out a bad one, the loss would fall upon the whole of the ratepayers? No doubt all parties—electrical engineers, gas companies, ratepayers generally, and municipalities themselves—will welcome an authoritative statement as to how far local authorities may (without the possession of any special powers) go in their efforts to secure the electric current consumers of whom very many of them stand so badly in need.

Success of the Yorktown Gas Company.

The Board of Trade have notified their intention to grant (subject to the approval of Parliament) the Provisional Order for which the Aldershot Gas and Water Company are applying. It will be remembered that this Company and the Yorktown and Blackwater Gas Company both have rights of supply over a certain area; and in 1901 a proposal was made by the former Company that they should be authorized to purchase the Yorktown undertaking. To this, however, the House of Lords Committee declined to accede; and hence a somewhat difficult position was created, though the district in question had hitherto been supplied solely by the Yorktown Company. When therefore the Aldershot Company applied for an Order to allow them to raise additional capital for the purpose of extending their works, the Yorktown Company asked that they should be prohibited from using any portion of the money for the purpose of starting a competing supply of gas. This request the Board of Trade have granted, by adding the following proviso to section 27 of the Order: "Provided always that, notwithstanding anything in the Act of 1896 or this Order or any other Act or Order contained, it shall not be lawful for the undertakers to expend or apply any part of the capital by this Order authorized to be raised or of the money belonging to the undertakers for the purpose of affording a supply of gas in any part of the district within which the Yorktown and Blackwater Gas and Coke Company, Limited, are by the Yorktown and Blackwater Gas Order, 1890, authorized to supply gas." The Aldershot Company made an honest endeavour two years ago to get over the difficulty by purchasing the Yorktown Company; but as they were unfortunately frustrated in this attempt, the present solution seems to be the most satisfactory one that could have been arrived at. The latter Company are to be congratulated upon the result of their appeal to the Board of Trade; and their Manager (Mr. J. Meiklejohn) will now be able to go about his work without being haunted by the fear that he might wake up some morning to find the "enemy" upon him.

Incandescent Gas Lighting in the City.

The report of the Engineer (Mr. D. J. Ross, M.Inst.C.E.) on the works executed by the Public Health Department of the Corporation of London during the year 1902, shows a gratifying increase in the number of incandescent gas-lamps. There were at the end of the year 942 of these lamps in use in the City, or an addition during the twelve months of 653, divided over the various districts as follows: North, 128; south, 99; east, 52; and west, 374. As, however, the number of gas-lamps paid for by the Corporation at the end of 1902 was 2155 (being an increase of 163 during the year), there is still plenty of room for the further growth of the incandescent system; and having regard to the figures of cost which Mr. Ross supplies, it can hardly be supposed that there will be any stop in this expansion until not a single flat-flame burner remains. With gas at the rate charged by the Gaslight and Coke Company—namely, 2s. 5d. per 1000 cubic feet—the cost of the 4·25 cubic feet incandescent lamps is £3 8s. 2d. each per annum; while that of the 5 cubic feet flat-flame burner and lamp is £3 14s. 3d. for the circular, and £3 10s. for the square lantern. This includes the cost of gas, cleaning, lighting, and maintenance. The charges for the various lamps (allowing in all cases 15s. per annum for lighting) are made up in this way: Incandescent—gas, £2 4s. 2d.; repairing, 3s.; and mantles, 6s. Flat flame—circular lantern, gas £2 12s., and repairing 7s. 3d.; and square lantern, gas £2 12s., and repairing 3s. With both systems the number of lighting hours is 4300 a year. Here, then, is an absolute saving in the cost per lamp in favour of the incandescent burner, quite irrespective of any question of the greater candle power afforded.

Experiments with High-Pressure Lamps.

Some particulars are given in the report of the experiments undertaken with high-pressure incandescent lamps, which were continued during the year. Three localities were chosen for these installations (which have already been fully noticed in the "JOURNAL"). At the northern approach to Blackfriars Bridge there are two of Sugg's "Westminster" lamps, each containing four 10-feet burners, for which an illuminating power of about 1320 candles per lamp is claimed; and two lamps having one burner each, the illuminating power of which is estimated at 330 candles per lamp. Another situation was at Ludgate Circus, where five triple-burner "Westminster" lamps were fixed; the light given by each being about 1000 candles. The third position is at the south end of Farringdon Street, where a large lantern containing six high-pressure burners, consuming about 10 cubic feet of gas per hour each, was fitted up by Messrs. Keith, Blackman, and Co. The illuminating power of this lamp is stated to be 2000 candles, or about 33 candles per cubic foot, which is the same as that of the lamps at Ludgate Circus and the approach to Blackfriars Bridge. We regret to notice that during the twelve months referred to there were so many occasions on which incandescent gas-lights were declared to be guilty of bad behaviour. The total number of defective lights observed by the Inspector of Gas Lighting was 4064; and of these no less than 3365 were in connection with incandescent burners—95 relating to the high-pressure lamps. The number reported by the police was 70—namely, 44 flat flames and 26 incandescents. Here we have quite a different result from that shown by the Inspector's figures. Possibly the police only take cognizance of the more serious faults, and very many of the incandescent defects were of a slight nature. This might account for the great difference in proportions shown by the two sets of figures. We notice that there were eleven occasions during the year on which the public lamps in the City had to be specially lighted because of fog or unusual darkness.

Subways for Pipes, &c.

Mr. Ross states that beneath the streets now under the control of the Corporation there existed at the end of last year 2538 lineal yards (or about 1½ miles) of subways. In addition to these, there is also a little over 1¾ miles of subway in the City not under the control of the Corporation, including Queen Victoria Street, the Victoria Embankment from Blackfriars to the City boundary and the pipe subways in front of the Mansion House constructed by the Central London Railway Company. The lengths of gas, water, and other mains and tubes, and electric lighting conduits laid in the subways under the control of the Corporation amount to 11 miles 1351 yards; being an increase of nearly 734 yards during the year. The usefulness of the Corporation subways is, Mr. Ross remarks, evidenced by the fact that in the streets beneath which they have been constructed no openings have been made for access to mains, &c. (except those for taking pipes into the ends of the subways), since they were completed. Under these circumstances, it is not surprising that the Corporation have now decided to further extend the subways by constructing one beneath the widened portion of Lower Thames Street, from Fish Street Hill to Monument Street. Under the provisions of the City of London (Various Powers) Act, 1900, bye-laws for regulating the charges for the use of the subways have been prepared; and these are now waiting the approval of the Board of Trade, to whom they had to be submitted.

Gas in Argentina.

With the publication to-day of the report of the proceedings at the annual meeting of the Buenos Ayres Gas Company, the review of the results of the operations in the past year of the three English Companies whose business is centred in Buenos Ayres is completed; and considering the long stagnation of trade in Argentina, which has happily now been broken, the financial achievements of the Gas Companies cannot be regarded as other than highly satisfactory. In the case of the Primitiva Gas and Electric Lighting Company they netted an increase in their balance of about £23,000; the River Plate Gas Company showed

an increase in profit not far short of £12,000; while the profit in the case of the Buenos Ayres (New) Gas Company was 15 per cent. greater than the previous year. In the case of all three Companies they had, on balance, nice additions to the numbers of consumers on their books; and both the Primitiva and Buenos Ayres Companies had respectable increases in consumption. But the River Plate Company were not so fortunate; their consumption showing a drop of 5 per cent., and there was a corresponding fall in the preceding year. But in their case, we believe they were more successful than the two other Companies in regard to the number of consumers they added to their roll; their gain in the year being no less than 1675. This is remarkably good; and, in face of it, a small recession of consumption in hard times can be looked upon by the shareholders with composure—the strength which the increasing numbers of consumers give to the concern being a good guarantee for an expanding prosperity in the future. All three Companies are fortifying themselves financially with good reserves, and yearly enlarging them. That they are able to do so in times like those just passed through, is an excellent sign. Another point is that fierce as the competition with the electric light is in Buenos Ayres, neither the Buenos Ayres New nor the River Plate Company has been greatly affected. "The competition," says the Chairman of the former, "has not prevented us showing considerable progress in our business;" and the River Plate Company only lost 23 consumers last year through that cause. In the case of the Primitiva Company, they supply both gas and electric light; but whereas the consumption of the former increased last year by 6 per cent., the latter only advanced 3½ per cent. Of the improvement in the Company's balance, £17,000 was contributed by the gas undertaking, against only £5000 by the electric light undertaking. What with a return to general prosperity in the country, cheaper materials and freights, and the large additions of new consumers, the prospects of the Companies are good. Carburetted water gas manufacture there is, for the moment, under a cloud. In the case of the River Plate Company, they have been compelled to temporarily give up the manufacture, because (says the Chairman) "the Customs Office authorities have detained a large shipment of oil belonging to another Company, and wish to levy a prohibitive duty on it—somewhere about £8 per ton."

A Contemporary's Warning.

But the brighter outlook for these Argentine Companies is, according to the "Review of the River Plate," in danger of being darkened by a little cloud. Our contemporary makes a statement to the following effect: "The Gas Companies charge 21 cents per cubic metre, with the exchange ranging from 201 to 225, and 23 cents from 226 to 250, and the tariff was arranged before the Conversion law was agreed upon. The present rate of 227-27⅓, which has ruled now for such a long time, is therefore just outside the limit; and should the premium fall three points, it would mean that the Companies would only get 21 instead of 23 cents per cubic metre. The news, therefore, that attempts are being made to have the official minimum lowered is such that, should the efforts be successful, they would have a considerable effect on the results of the Gas Companies." Our contemporary, however, overlooks the effect that lower prices have in inducing great sales of gas.

Institution of Gas Engineers.—Mr. Walter T. Dunn, the Secretary of the Institution, asks us to notify that arrangements are in a forward state for the annual general meeting to take place on June 9, 10, and 11. By the courtesy of the Council of the Institution of Mechanical Engineers, the meeting will be held at their House, Storey's Gate, Westminster, S.W. Full particulars will be issued to the members in due course.

Analyses of British Coals and Coke.—There has just been issued the first part of a series of analyses of British coals and coke which is appearing in the columns of the "Colliery Guardian." In collecting these analyses, the object has been to classify them in districts over the coalfields of Britain, and so place them as regards kinds of coal that they will form not only an exhaustive list of the particular sorts of coal and coke produced in the respective districts, but also prove of value to those connected with the trade, either in a productive or in a commercial capacity, because of the ease with which comparisons of various coals can be made, and their marketable value computed. Part I. deals with the coals of Northumberland, Durham, and Yorkshire; and Part II. is in a forward state of preparation.

WATER AFFAIRS.

The Chairmanship of the Water Board.

At their third meeting, last Thursday, the Metropolitan Water Board dispelled an impression which had been entertained in certain quarters that they would have some difficulty in selecting a gentleman to preside, without fee or reward, except the honour attaching to the position, over what will necessarily be their very important deliberations. By a practically unanimous vote (there was just one dissentient), Mr. R. Melvill Beachcroft was elected the permanent Chairman of the Board; and if it was the wish of the members, as it may be presumed it was, to have a Chief chosen from their own body, we have no hesitation in saying that, without in the least disparaging the abilities of the other gentlemen whose names had been mentioned, a much better choice could not have been made. On the nomination, at the first meeting of the Board, of the Special Committee to deal with preliminary matters, Mr. Beachcroft was appointed Chairman, and, by the manner in which he discharged the duties, and by the evidence he furnished of the possession of special knowledge of the particular business of the Board, as well as of long experience of public work, he gained the confidence of the members, and proved his fitness for the higher position he has been called upon to fill.

As a member of the County Council, Mr. Beachcroft has always favoured moderation in dealing with the Metropolitan Water Question; and in the few remarks he made in acknowledging his election, this spirit was a conspicuous feature. He has been actuated, as many others have been, by a desire to see this question—the subject of so many years of bitter controversy—permanently settled, but not, as some people would appear to have wished, "unfairly to those great Com- "panies who have for the past hundred years endeavoured "to do their duty in supplying water to a vast community." Mr. Beachcroft, as the representative of a by no means insignificant section of the ratepayers in the Metropolitan area, is naturally desirous that justice should be done to the entire body; and we are warranted in concluding, from his first official utterances, that he will be equally so with regard to the other parties to the important transfer which is about to be carried out. We may be pretty sure there will be no favouring of the "old iron" policy in estimating the worth of the undertakings the Board will acquire.

The Chairman did well to lay stress upon the fact that the Board had been constituted for a specific purpose, and that therefore it would be advisable that politics should be excluded from their discussions; also that work, not talk, should characterize their periodical meetings. The public will look for results; and these can be better achieved, as he pointed out, by the Board not bringing themselves forward too prominently. The election of Chairman was the principal business on Thursday; the selection of the Vice-Chairman being adjourned. There was an even division of opinion as to the best day for holding the meetings of the Board; and it was only by the casting vote of the Chairman that Friday was fixed.

The Periodicity of Drought and Rain.

The article on the above subject which appeared on the 13th ult. in "The Times," to which reference was made in this column at the time, has given rise to some interesting correspondence in that paper, which has had the effect of awakening in certain quarters a desire for more data calculated to support or otherwise the theory of the periodicity of drought and rain with special reference to the British Islands. The contention of Messrs. Sowerby Wallis and Mill, it may be remembered, was that our rainfall records did not correspond with any definite cycle, whether the Brückner or any other; and in their letter commenting on the statements in the article, they cited, as mentioned a fortnight ago, some facts collected by the late G. J. Symons which strongly supported their conclusion. For example, taking the dry and warm centres—viz., from 1795 to 1860—and adding thereto the next Brückner cycle of 35 years, bringing the entire period down to 1896, they showed that of the four instances adduced by them two fully supported and two disproved the theory. With regard to the wet and cold centres, 1815 was an average year preceded by fifteen years all dry, and followed by five of which only two had

trifling excesses. Of the ten years 1845-54, only four had more than the average rain (1850 was, in fact, a dry year), while six had less; but there were marked excesses in 1848 and 1852. The year 1880 was a wet one in a group of nine. On the whole, then, Messrs. Wallis and Mill do not think the weight of evidence in regard to the wet years supports the theory of periodicity.

The foregoing data were obtained from a diagram based on English stations alone, none of them being to the west of Plymouth. But a subsequent correspondent, a Fellow of the Royal Meteorological Society, pointed out that in going so far west as Plymouth the above-named gentlemen might be said to have embraced all England. He thought it would be more to the purpose to show how far the rainfall in London, or at a group of stations east of the Greenwich meridian, accorded with Dr. Brückner's cycle. He cited the striking facts in connection with the Observatory town that between 1864 and 1882 there were thirteen wet and only four dry years, while the remaining one was an average year; and that between 1883 and 1902 there were four wet and fifteen dry years, while again one was an average year. It will be very interesting to see if these variations will be repeated, and also to know what happened in Eastern England prior to 1864. In fact, the whole subject of rainfall and the applicability of the Brückner theory to this country will bear elucidation; and, with the view thereto, the suggestion thrown out by the correspondent whose letter on this subject appeared in last week's "JOURNAL" may be favourably considered when occasion serves. Meanwhile, we notice that the Metropolitan Water Board, at their meeting on Thursday last, referred to the General Purposes Committee a suggestion to the Clerk of the London County Council that the Board should continue, as from the 24th prox., the arrangement made by the Council with Mr. Wallis for keeping records of rainfall.

Testing Gas on Sundays.—The action brought by the London County Council against the South Metropolitan Gas Company asking for a declaration that the Gas Examiners appointed by the former are entitled to make tests of gas on Sundays, permission to do which had been refused by the defendants, came before Mr. Justice Joyce yesterday (Monday). Mr. Hughes, K.C., and Mr. Methold appeared for the plaintiffs; Mr. Warmington, K.C., Lord Robert Cecil, K.C., and Mr. Rostron for the defendants. Mr. Hughes argued that, as section 7 of the Act of 1880 said the gas was to be tested "daily," the plaintiffs were entitled and bound to make the tests. The defendants urged that "daily" meant every week-day; and evidence was given to the effect that no advantage would accrue to the public from the gas being tested on Sundays. His Lordship, however, decided in favour of the plaintiffs, and made the declaration asked for. A full report of the case will appear in our next issue.

Engineering Conference of the Institution of Civil Engineers.—The third engineering conference of the Institution of Civil Engineers will take place on the 17th, 18th, and 19th prox. The conference will, as on former occasions, be divided into seven sections, one of which will be devoted to water-works, sewage, and gas-works. The Chairman of this section will be Sir Alexander Binnie; the Vice-Chairmen, Messrs. George Chatterton, M.A., George F. Deacon, Walter Hunter, and Corbet Woodall; and the Hon. Secretaries, Messrs. G. H. Hill, G. M. Lawford, and E. H. Stevenson. The subjects to be discussed at the conference include "Internal Combustion Engines for Driving Electrical Generators," "Steam and Gas Driven Blowing Engines for Blast Furnaces," "Bacterial Treatment of Water and Sewage up to Date," and "Coal-Gas Standards and their Determination." It is hoped that, among the works open for inspection by those attending the conference, may be the Staines reservoirs and the East Greenwich Gas-Works.

The Coal Commission.—At the meeting of the Royal Commission on Coal Supplies last Tuesday, Dr. Boverton Redwood, Adviser to the Home Office and to the Corporation of London on the Petroleum Acts, gave evidence. He pointed out that petroleum and allied hydrocarbons were used as a source of power in internal combustion engines, as well as for steam-raising; and that this had to be borne in mind in a comprehensive review of the subject. He put in statistics as to the output of petroleum, and gave the prospective available sources of supply at present unworked, with special reference to the requirements of the British Empire. He also dealt with the specially constructed tank steamers for the carriage of petroleum and the storage and distribution of petroleum products. On Wednesday, Professor Lewes gave evidence with reference to illuminating gas and the gasification of oil. He said he thought considerable economy in the amount of coal now used in the manufacture of gas might be anticipated from the present tendency to reduce the illuminating power, from the extended use of water gas, and from the growing popularity of incandescent mantles.

ESSAYS AND REVIEWS.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 311.)

THE chief event of the Stock Exchange week was the Brighton walk; but that is another's story. As regards the minor consideration of business, things ruled quiet and movements were irregular. Consols and their kindred were depressed by uncertainty regarding the imminent new loan; but some other markets were on the rise. Besides the interruption to business caused by the May-day closing, there was the settlement to get through. But this was not a big affair, and appears to have been smoothly negotiated. In the Money Market, there was a steady stiffening of rates until the end of the month had been turned and the Stock Exchange settlement requirements had been met; and the passing of another Thursday without the Bank rate being lowered helped to tighten the position. In the Gas Market, business opened full of promise; and a resumption of activity appeared to be in course of development. But it rapidly died away; and the rest of the week was quiet. The general tendency, however, was good; and although there were one or two small movements in the downward direction, yet they were well overbalanced by the advances. Further encouraging reports come to hand in evidence that the Companies are doing good business; and, if the coal contracts of the season can be agreed at a reasonable reduction below last year's figures, prospects in general would seem to be fairly rosy. In Gaslight and Coke issues, the ordinary stock was very active at first, although it became quieter later on. The price was steady and close, and gave no indication of any disposition to move—83½ being about the figure at the opening and at the close. The secured issues were only moderately dealt in as a whole; but the preference was in good request, and had a further advance—changing hands once at 109½. In South Metropolitan, transactions were on a limited scale; but prices hardened steadily, till the final mark was 120, and the quotations advanced a point. Nothing at all was done in Commercials. The Company have got their Bill in Parliament through as an unopposed measure, and have thus a prospect of immunity from harassing legislation and its concomitant expenses for another three years. In the Suburban and Provincial group, there was the usual dearth of business; but there were some good advances, Tottenham "B" being conspicuous. In the local Exchange, however, Liverpool was put down a point. In the Continental Companies, business was on a small scale, and prices were not remarkably good in any issue, while Imperial receded a point. Among the undertakings in the remoter world, the South American Companies were conspicuous for improved quotations. The Water Companies did not furnish so much of interest as in the week before; but two or three further advances in quotation were effected.

The daily operations were: Gas was very busy on Monday; but the only move was a fall of 1 in Imperial. In Water, Southwark rose 2, and ditto "D" 5. Tuesday was quiet. River Plate rose ½. In Water, Lambeth rose 5. Wednesday was no brisker; but Buenos Ayres and Monte Video rose ½ each. Thursday was about the same. Tottenham "B" advanced 3, and Buenos Ayres ½. On Friday, the Exchange was shut. Saturday was a busier day, with good prices. South Metropolitan and Gaslight preference rose 1 each.

THE CRITERION OF MANUFACTURING METHODS.

IT cannot have escaped the more reflective among gas engineers that matters of, and in connection with, coal carbonizing are moving towards some interesting new developments. Never at any previous epoch in the history of gas manufacture have there been so many and various good and satisfactory systems and appliances competing for favour and employment. This multiplicity of rivals for the gas-maker's choice does not tend to lighten his responsibility, or to lessen his care in respect to the earning of a satisfactory dividend. Quite the contrary; for, as we have freely admitted in an earlier essay, the dilemmas of the gas manager are only made more numerous and insistent by the crowd of profferers of assistance who to-day dog his steps. Fortunately for himself and his employers, the average British gas manager usually possesses, as part of his personal equipment, a very respectable measure of that power of forming a sound judgment on the merits of the things he sees around him which is one of the most valuable attributes of anyone occupying the office of a steward of others' interests. Being human, he is open to be touched by clever representation and 'cute advertisement; but he is rarely so far carried away by the fashion of the moment as to lose sight of the main chance. This truly British attitude of reserve is likely to be strengthened by some observations recently published in a technical contemporary with regard to the late crisis in German industry. It was not so long ago that the admiration of the civilized world was being challenged by the splendour of the mechanical and other arrangements of the leading North German manufacturing establishments. Millions had

been spent on bricks and mortar, iron and steel constructions, and electrical power, by the first few of these go-ahead concerns, on whose staffs doctors of science and of philosophy were as plentiful as the dukes and prime ministers in Gilbert's imaginary realm. Unfortunately, these luxuries did not make paying business. Vast quantities of manufactured products had to be unloaded on the open English market at any prices to effect a realization; and the pregnant commentary has been published that only the old-fashioned, quiet German shops contrived to do a profitable trade at all.

The British gas manager, assailed on all sides by clever people with every kind of labour-saving and other machinery to sell, is not, one would hope, likely to turn a deaf ear to all in the style which used to be complained of in the days before gas companies had a competitor in their own line of business. While never forgetting the interested motives of those who legitimately contend for his orders, the modern gas manager has given far too many proofs of his accessibility to new ideas, to deserve the slightest reproof for such lack of enterprise as was formerly imputed to the legendary exemplars of the old school. The present danger is rather of the opposite kind. For it must never be overlooked, that there is really a pedantry of "progress," and of "mechanical improvement," as there is a supineness in routine; and it would be hard to say which is the worse error for a man who is responsible for making a manufacture pay.

There are some decisions which the gas manager must make for himself, having regard to his own special and peculiar circumstances, and in the framing of which he must hold at bay all his numerous good friends with things to sell. These may all be very good; but they will certainly not all be equally good for his money. He perceives that at such an expenditure of capital he may confidently hope to save so much labour; but if his capital outlay is already heavy, he cannot afford to yield to the attraction offered. As a mechanician, he may be tempted; but as one who is self-sworn to husbandry of capital, he has to refrain. As the Bengalee Baboo has it, he must hunt the shy *cui bono* to its uttermost lair. Moreover, as regards much labour-saving machinery, the opinions of Colonel Yorke as a witness of American railway methods are clearly not to be gainsaid. There is no real justification for supplanting men by machines, for the mere sake of the change. At the period when working men everywhere appeared to be bent upon rendering themselves impossible, on the instigation of the "New Trades Unionism," there was (as we admitted) an impulse given to the introduction of men-supplanting machines in gas manufacture which had previously been lacking. This at present has greatly subsided. The "Iron man" came into English retort-houses because the man of flesh and blood chose to make himself impracticable. It remains because under certain conditions it is a real gain to the manufacturer of gas. But where there is no balance of advantage in favour of machinery, but merely an equivalent for labour, there is no economic justification for the change. Colonel Yorke's testimony is to the purport that much American labour-saving mechanism of which one hears such fulsome accounts, is only used because human labour is not available. It is not necessarily an improvement, in respect to efficiency, even where it is cheaper.

There is a very noticeable thing about mechanical engineering, as many have remarked, which is the fact that, as the homely saying runs, there is in it a good deal of "saving at the spigot and wasting at the bung." An infinity of pains is bestowed upon certain elements of a mechanical combination, which perhaps lend themselves to extreme refinement; while others of far greater importance in every practical sense are left alone. Thus a steam-engine will be made at high cost to develop an indicated horse power for a small consumption of steam; while the boilers used with it may be veritable fuel-eaters, and the intermediate gear between the engine and its work may absorb half its original power. Besides this, the more elaborate the machinery, the more costly it is to look after and keep in proper order. We have employed the term "mechanical pedantry" in the course of this essay. Let us attempt a definition of the term in this particular connection. A mechanical pedant, then, is a man who takes account only of some favourite element in a certain cycle of operations. This may be steam consumption per indicated horse power, or wages paid for coal carbonizing. All else he will disregard, quite heedless of the truth that, from the ultimate commercial point of view, everything comprised in the cycle of operations is to be expressed in terms of money spent for money earned. The shipowner does not care one straw about the niceties of mechanical engineering. All he wants to know is the cost for which a passenger can be carried or a ton of cargo moved a mile—not omitting the safeguarding of the investment. A similar consideration should govern the engineering of gas manufacture. The rest is detail.

If the one thing needful to be kept in view, and used as the touchstone for all manufacturing developments, is expressible in one word, that word is "output." In the long run, the commercial valuation of every part of an industrial establishment hinges upon the output. Other considerations may imply economies—savings in the cost of manufacture, distribution, management, or what not. These are not to be despised—far otherwise, indeed, as in any factory a penny saved is a penny gained. But economies are not business. In some circumstances they may be the very opposite. Cheeseparing methods never yet made trade. There are times when saving only points the road to bankruptcy. Increase of the output is the one and only way to make a manufacturing business more profitable; and any hesitancy about effecting this at a certain enhanced expenditure for the time being is not good husbandry, but sheer bad trading. The object of the present essay is to distinguish the importance of this consideration, as the criterion of value in all new gas manufacturing developments. Microscopic advantages are of no use whatever. It is the same with the mechanical engineering trade, the transportation agencies, and every other industrial and commercial undertaking. This principle, indeed, has been claimed by American engineers as the great discovery of their national system of trade and industry. French and German engineers, it has been remarked, are extremely able in their profession, and especially good at economizing material. Englishmen are unexcelled in organization, and have carried the subdivision of skilled and trained labour to its limit. Americans pretend that to their credit must be placed the crowning triumph of appreciating the importance of increasing output per unit of capital, land, administration, or labour. This is the real reason why the American employer will rather die than submit to Trade Union dictation of how much work a man should do in a day, or how many machines he shall attend to. It is not because he wishes to save labour that the American manufacturer patronizes labour-saving machines, but in order to get a larger return for his investment. If a workman can turn out double the usual quantity of work, he will gladly pay him double the amount of wages—knowing that he is saving on the standing charges. For the same reason, the American manufacturer was the first to take up electric power for tool driving—not because of its cheapness, for it was dear, but on account of the prospect of increased productiveness which it offered. American employers and workpeople have their differences, like others in older countries. Trade Unions and Trusts bark and bite according to their nature; and sometimes one interest gets a "pull," and sometimes it is the turn of the other. But it is always quite understood that there is to be no nonsense about the limitation of the quantity of labour, or output, which constitutes a day's work. The American employer wants every dollar, and machine, and man in his business to yield every fraction of their capacity, all the time. It is a simple piece of information that the Mosely Commission brought back the other day—that the American workman "does not object" to labour-saving machinery. He did, once upon a time; but his objections were quelled for good and all by grapeshot and bayonet charges. He has not forgotten that this is a point for which the employer will fight at any time, with the "gloves off;" consequently it goes undisputed. The subject is mentioned in order to illustrate the main argument of this essay—that the output is the thing that matters in industrial economics, those of the gas manufacturer not excepted.

ELECTRIC LIGHTING MEMORANDA.

The Troubles of the Poplar Electric Lighting Committee—The Depreciation Allocations of the London Electric Lighting Companies—The Prospects of the Undertakings—Recoupment against Depreciation.

MATTERS are progressing very peculiarly in regard to the electricity supply of Poplar, briefly mentioned in this column last week. The affairs of the undertaking came before the Borough Council on a report from the Electricity Committee dealing with a previous refusal of the Council to sanction a large scheme of extension which would have about doubled the capital expenditure—ostensibly for the lighting of a Thames tunnel and other jobs of a more or less temporary character. It has now transpired that this refusal to contemplate extension has placed the Committee in some difficulty in respect to carrying on the existing establishment. The plant is declared to be loaded up to within the danger limit, and the Committee proposed that fresh applications for current should be refused. This suggestion seems to have alarmed the Borough Council, who saw in it some justification for the suspicion that the policy of extension was designed to cover up the deficiency of the existing installation. Moreover, they perceived in the new report of their Committee a note of pique and resentment at having their former demand rejected. Besides all this, there is the prevailing dissatisfaction in regard to the accounts. Consequently, the report of the Committee was referred back, which decision on the part of the Borough Council is locally counted for prudence and duly placed to the credit of this body as a whole. Inasmuch as the reputation of the Borough Council can only be preserved at the expense of that of their own Electricity Committee, the balance of credit on the whole business is not strikingly heavy.

One of the electrical periodicals has again taken up the subject of the depreciation allowances of the London Electric Lighting Companies, and concludes that the warnings so repeatedly given in this respect are beginning to take effect. There is apparent a tendency among the more prosperous of these undertakings "to make a bid for public confidence by improving their position in this connection." It was high time; and even now the requirements of ordinary producers are not observed in many instances. Of course, the question of depreciation is set round with many complex considerations. So far as electric lighting companies constituted under the strictest provisions of the Act of 1888 are

concerned, with every probability of being expropriated after 42 years' existence, it is obviously expedient that they should make such provision as may be necessary to preserve the integrity of the investment. At the end of the statutory period, such companies are liable to be bought out upon a structural valuation, which should be about equivalent to the amount of the outstanding capital. If there is a deficiency, it should be payable out of accumulated funds. It is usually held that a yearly allocation calculated at 3 per cent. of the amount of the depreciable capital spells financial soundness in such cases. A standard rate of 2½ per cent. on the depreciable capital—which does not include the land value—is considered respectable, having regard to the consideration that the land usually appreciates in value.

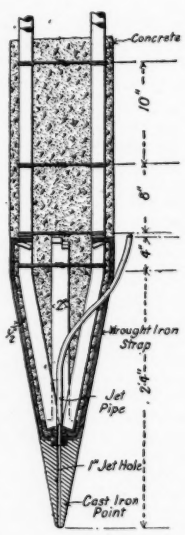
Judged according to this rule, several of the wealthiest London Companies come out very well. Some of them exceed the amount expected, which they could well afford to do, instead of paying 16 to 18 per cent. dividends. The significant feature of electric lighting companies' finance is that the amount of their profits, or the rate of dividend they pay, does not interest the local authority except for rating purposes. Where the local authority contemplate the distant prospect of buying up the property, this consideration, which would be of moment in the case of a gas company, is no concern of theirs. It is entirely a matter for the companies and their customers. In these circumstances, according to the fond imagination of fervid municipalizers, there may be expected bloated dividends on one side, and a groaning, monopoly oppressed public on the other. But the facts are different. The really prosperous electricity supply undertakings of London belong to some half-dozen Companies. These supply the best parts of the Metropolis, whether commercial or residential, where the inhabitants have as keen a notion as any people in the world of the value of commodities and services. They get their electric lighting at a fair price, and they have the satisfaction of knowing that another part of the charge does not come upon them disguised in the rate-paper. It is no affair of theirs how much depreciation the proprietors of the plant think fit to charge against their profits. As a matter of fact, most of these Companies need entertain little fear of losing much by the Act of 1888. The parochialism of this Act has defeated its own object, so far as London is concerned. The Metropolitan borough boundaries have no correspondence with the areas of the Companies, whose position is further complicated by the fact of some of them existing under competition. At the same time, both the London County Council and the Government are alive to the obstacles thus put, accidentally and incidentally, in the way of the application of the purchase clauses of the Act of 1888 to the London Companies, and have declared their intention of overcoming them in some way by fresh legislation.

Therefore, the Companies in question are wise in making provision, where they have the means of doing so, against a possible day of expropriation at an old-iron price. But this is not the sole consideration to be regarded in their circumstances. In almost every case the costs of pioneering and financing were heavy. Most of the undertakings have had to scrap an immense quantity of costly plant; and the end of this process is not yet reached in every case. Through how many phases, for example, has the Chelsea Company survived, from the early days of those wonderful balancing accumulators! There has been a relentless levelling up, or down, of all these mechanical plants, since Mr. Ferranti's bold engineering for the trade that failed to come to Deptford. What is needed in many cases is not provision for the future, but recoupment for the past. Nobody could object pedantically to concerns that have suffered so heavily from diverse causes as the London Electric, the City of London, or the Chelsea Company, applying funds that would otherwise go for depreciation to the repair of ancient physical or financial dilapidations. The road to such success as the electric lighting interest has achieved in London has not been either safe or easy to travel. Few of the many undertakings even in the Metropolitan area are really prosperous, and others can just keep going. None of the municipalized undertakings could survive without support from the rates in one form or another. Consequently, it seems almost insulting to inquire how these insolvent properties stand as regards depreciation; but the question will be asked some day.

METHODS OF MAKING FOUNDATIONS IN REINFORCED CONCRETE.

REFERRING to the articles that appeared in the "JOURNAL" for the 7th and 14th ult., describing the construction of retort-houses upon a design depending largely on the use of reinforced concrete, it is worthy of mention that a very successful example of warehouse building in "ferro-concrete," on the Hennebique system, was illustrated in "Engineering" for April 17. The building is at Newcastle-on-Tyne; and it is mentioned in connection with our articles for the reason that it is a solution of a problem in construction which often occurs in gas engineering practice—namely, the building of a heavy structure upon bad ground. The low-lying situation of many gas-works, and their location for convenience of water carriage, make the engineer unpleasantly acquainted with strange conditions in the matter of subsoil. The case of the Hennebique warehouse at Newcastle-on-Tyne, however, is probably about as bad in this respect as anything in gas engineering experience. It has a frontage of 92 feet to Quayside, above which it rises to a height of 120 feet. The site presented the following interesting succession of strata: 18 feet of made ground, principally clay, 18 feet of silt and quicksand, 10 feet of soft clay, 5 feet of hard clay, 10 feet of silty sand, and finally gravel. This meant a depth of upwards of 60 feet beneath surface level before a sound foundation could be reached. It was originally proposed to sink cylinders to the gravel, and lay over their tops a concrete sill with railway metals embedded in it. Piling was also thought of, but was abandoned through fear of the consequences to the surrounding property. Eventually it was decided to have recourse to a raft of Hennibique ferro-concrete covering the whole of the site. This was effected by forming the area space into squares of about 14 ft. 6 in. side, at a depth of 22 feet below the ground level. The sides of these rectangles are ferro-concrete beams, 2 ft. 6 in. square, reinforced with ten 1½-inch bars; and between them the panel of ferro-concrete is only 7 inches thick. The size of the panelling is that of the flooring squares throughout; the columns standing on the beams. Although the building is so strong that all the heavy weights can be hoisted directly to the roof, where the bulk packages are broken up, and the contents distributed downwards to the different floors, the walls at the ground level are only 12 inches thick, and 4 inches thick at the flat roof. The erection of this building was favoured by the common-sense of the Newcastle Corporation, who abrogated for the purpose their building regulations, framed for other systems of construction.

A somewhat curious commentary upon the above construction, in the shape of an alternative plan, has been described in the "Engineering Record" as characterising the extension works of a certain building in New York. In this case, similar foundation difficulties were encountered as named above. The older building which was to be extended, was built upon wooden piles; but for various reasons this method of making a foundation could not be repeated. The subsoil showed the following strata: 5 feet of fine gravel, 2½ feet of fine sand, 5 feet of coarse sand, 5 feet of sharp sand, 2½ feet of fine gravel, and beyond that compacted, firm sand, which was the foundation to be attained. This was done by employing reinforced concrete piles fashioned like the accompanying illustration.* The method of sinking was by a water-jet, as shown. These piles are inserted in the sand to a height of 6 feet above the present ground water level, where they are to be capped by a strong sill of rolled joists buried in concrete. Thus there will be no trenching, or lock filling, or underpinning of the adjacent structures. The piles are 28 feet long, and 12 inches square, composed of 1 : 2 : 4 portland cement : sand : broken trap stone concrete, made in wooden moulds. The metal reinforcement is composed of four $\frac{7}{16}$ inch soft steel round rods, which are tied together by horizontal hooked wires spaced 5 inches apart. At the bottom, the rods are bent to conform to the angle of the pyramidal pile point, and seated on a solid cast-iron driving point, which is locked to the pile by means of embedded wrought-iron strips bent 90° at the top. These piles are calculated to be loaded to 80,000 each, and are sunk in clusters of six, at 16 inches apart, and spaced for 12 feet centres. When driven, the top 5 inches of the piles is chipped so as to expose the reinforcing rods, which thus project bare and are buried in the connecting concrete beam. Thus the footings of the walls and the piling are bound together.



It is a significant observation of the describer of this construction in the "Engineering Record," that "the system has been carefully designed so as to avoid the use of patented features." This does not look as if the great American patent system, of which so much is heard from its English admirers, is so generally esteemed by Americans whose acquaintanceship with it may be supposed to be of the closest.

At the annual general meeting of the Institution of Civil Engineers last Tuesday, the result of the ballot for the election of Members of Council for 1903-4 was declared. The President is Sir William H. White, K.C.B., D.Sc., L.L.D., F.R.S.; and the Vice-Presidents, Mr. Francis W. Webb, Sir Guilford Molesworth, K.C.I.E., Sir Alexander R. Binnie, and Dr. A. B. W. Kennedy, F.R.S. Among the other members of Council are Mr. G. F. Deacon, Mr. G. H. Hill, and Mr. Alexander Siemens.

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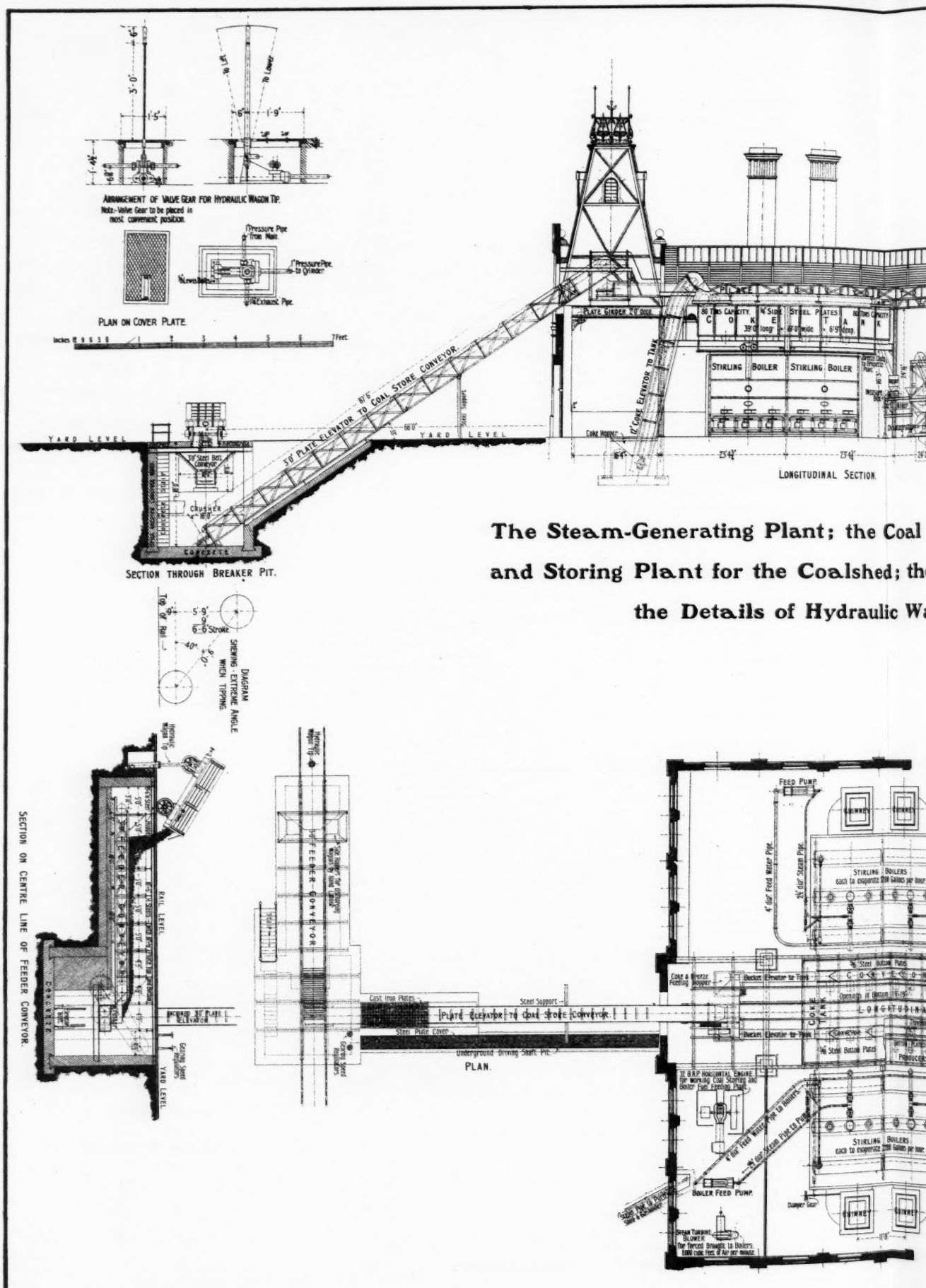
* This arrangement has already been noticed in the "JOURNAL" in connection with the visit of the Society of Engineers to Southampton last summer, when they inspected some Hennebique piles which were being used for the widening of the Old Extension Quay (see Vol. LXXX., p. 214).

The Granton Works of the Edinburgh



The Steam-Generating Plant; the Coal

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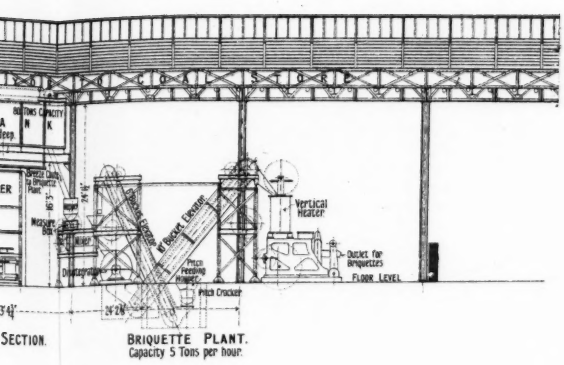
nburgh and Leith Gas Commissioners.

No. 18.



SECTION. BRIQUETTE PLANT. Capacity 5 Tons per hour.

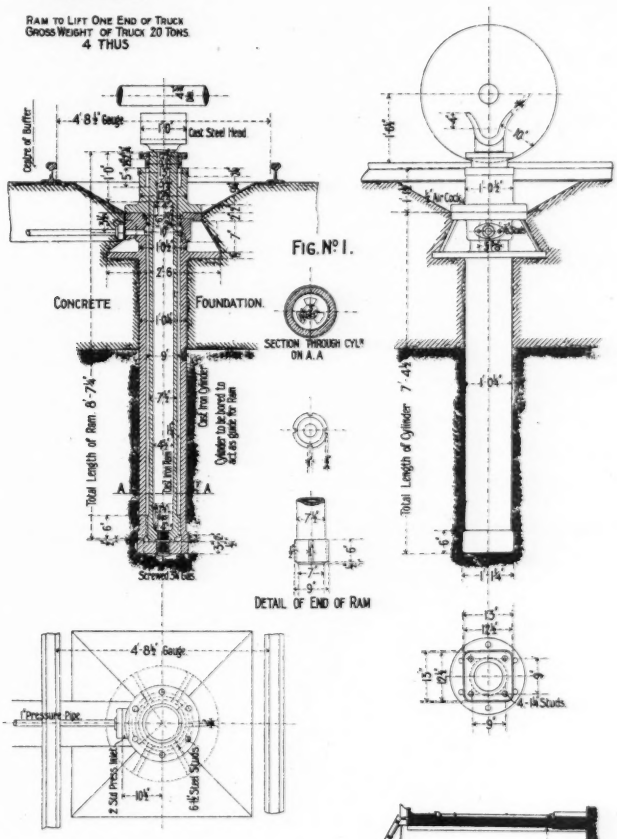
the Coal Discharging, Elevating,

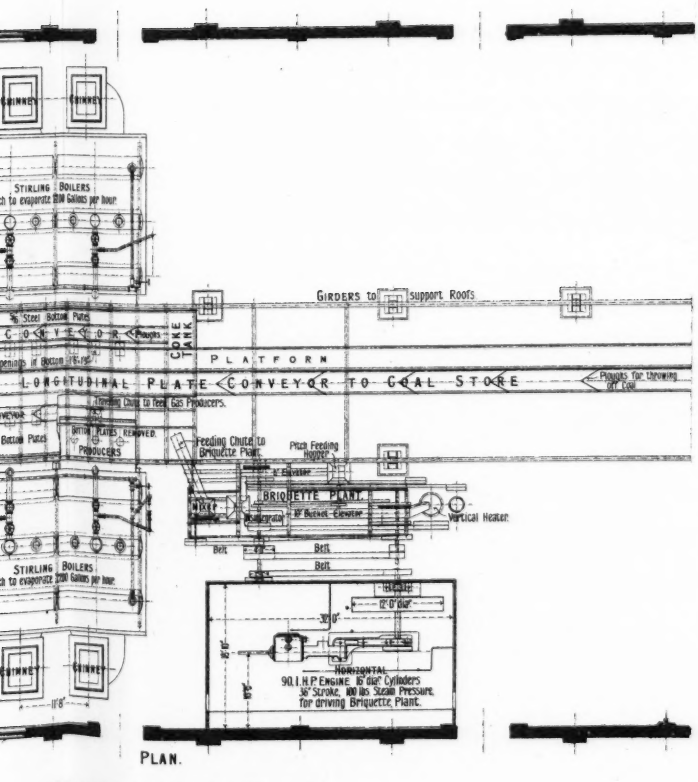
lished; the Briquette Plant; and

draulic Waggon Tip.

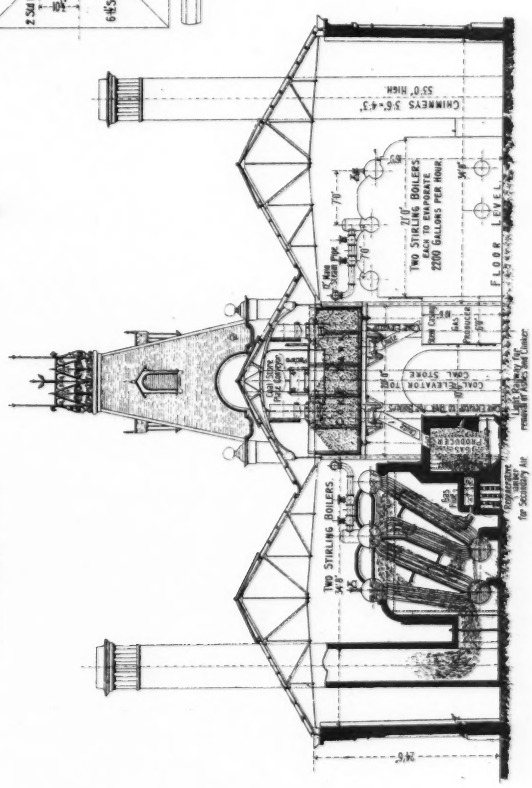
DETAIL OF HYDRAULIC WAGON TIP
Test Pressure 2500 Lbs Per □"
Working Do. 700 Lbs Per □"
Maximum Stroke 6'-6"

RAM TO LIFT ONE END OF TRUCK
GROSS WEIGHT OF TRUCK 20 TONS
4 THUS





PLAN.


CHIMNEYS 5'6"-4'3" DIA. 55'0" HIGH
Two Stirling Boilers each to evaporate 2200 Gallons per hour.
FLOOR LEVEL
COAL ELEVATOR
COAL STORE

CROSS SECTION AT NORTH END OF COAL STORE BLOCK SHEWING BOILER SETTINGS. GAS PRODUCERS. FUEL BUNKERS ETC.
FIG. Nº 2.

WALTER RALPH HERRING,
M.INST.C.E., *ENGINEER.*

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

BY

WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

ARTICLE XVII.—Accompanied by Plate No. 18, illustrating the Steam-Generating Plant, the Coal Discharging, Elevating, and Storing Plant for the Coal-Shed, the Briquette Plant, and the Details of the Hydraulic Waggon Tip.

STEAM-GENERATING PLANT AND PIPING—COAL-STORING PLANT—BRIQUETTE PLANT.

The steam-generating plant is accommodated in the north end of the coal-store block of buildings. It consists of four multitubular boilers of the Stirling type, each capable of evaporating 2200 gallons of water per hour. The boilers are arranged in pairs, set face to face, with a gangway between 10 ft. 6 in. wide, as illustrated on Photograph No. 82. The boilers are fired by means of producer gas generated in producers of a similar type to those employed in the retort settings, excepting that they are also fitted and actuated with forced-blast arrangements—the blast being generated by a fan, driven by a steam-turbine.

Plate 18, fig. 2, shows a cross section of the boiler-house with one of the boilers in section—illustrating the boiler-setting and one of the producers. This is better seen on Photograph No. 83, which also shows the steel casement enclosing the producers. Each separate boiler is fitted with three producers, having separate clinkering-doors and grates, as well as feeding-doors from the coke-tank above. By this means, an even flow of gas to the boiler-setting is assured; clinkering operations being carried out in one producer while the other two are in full and general work. It may perhaps be interesting to note that it has been found possible to completely envelope the entire nest of boiler-tubes with flame from the combustion of the gas generated in the producers.

The secondary air supply is heated to a certain extent by causing it to pass through honeycombed passages beneath the gas-ports immediately at the back of the producers; the air being afterwards distributed through nostril holes immediately beneath corresponding nostril holes communicating with the gas-flue, which in turn communicates with the producer at a point below

PHOTOGRAPH No. 82.—General view of the steam-generating plant, with the fuel tank above.

the normal surface of the fuel-bed, but yet sufficiently above the grate-bar to ensure the thorough conversion into combustible gas of the carbonic acid produced in the primary combustion at the base of the fire.

The producers are fed automatically from a fuel tank situated above them. This tank is 18 ft. 6 in. from the ground line, and contains 80 tons of fuel. Beneath the tank, traversing shoots are made to run on light rails suspended and attached to the bottom of the tank for feeding the producers from the coke-store overhead. The coke-bunker is fed by means of a duplicate set of 12-inch bucket elevators; the elevators discharging on to 24-inch steel-plate conveyors, which distribute the fuel in the tank, from which it descends by gravity into the producers beneath. The arrangement of the producers is such that direct firing from the ground-floor level can at any time be resorted to; and in the event of slow firing being necessary, the boilers can in the course of a few hours be converted from producer to ordinary direct-fired boilers. The fuel used for the boilers consists of unscreened coke and breeze. It is delivered direct to the elevator boots by means of the 2-foot gauge railway and tipping waggons; the coke-handling plant filling these at will. Afterwards they are transported to the boiler-house, where the waggons are weighed, and their contents tipped into the elevator boots, which in turn deliver them to the bucket elevators, and thence into the coke-tank above. The coke-tank measures 39 ft. by 19 ft. by 6 ft. 9 in., and has a capacity of 5002 cubic feet, or about 80 tons of fuel. One end of the tank is also made to serve the briquette plant with coke dust and breeze; the plant being located immediately alongside the boiler plant, as will be seen upon reference to Plate 18.

The elevators and conveyors in connection with the steam-generating plant are worked by the same engine that is used for manipulating the coal unloading and storing plant, and is capable of running both plants.

It will be noticed from the plate that the boiler chimneys are only 53 feet high.

At the outset, it was intended to place the boilers at the south end of this block of buildings, so as to be near the principal steam-power plant. After carefully considering the matter, however, I concluded that it would be more economical to transport the steam to the different points where it was wanted on the works, rather than be at the expense of putting down one or more steam-generating plants and transporting the fuel from the coke-yard to these different points, with the consequent removal of ashes therefrom to a place where they could be loaded into waggons for transport. Altogether, I am quite satisfied that this is the most economical thing to do; and the working results have shown that it is a most satisfactory arrangement. The loss of pressure in the length of 700 feet of piping is infinitesimal; and the introduction of steam-separators at the large engines beneath

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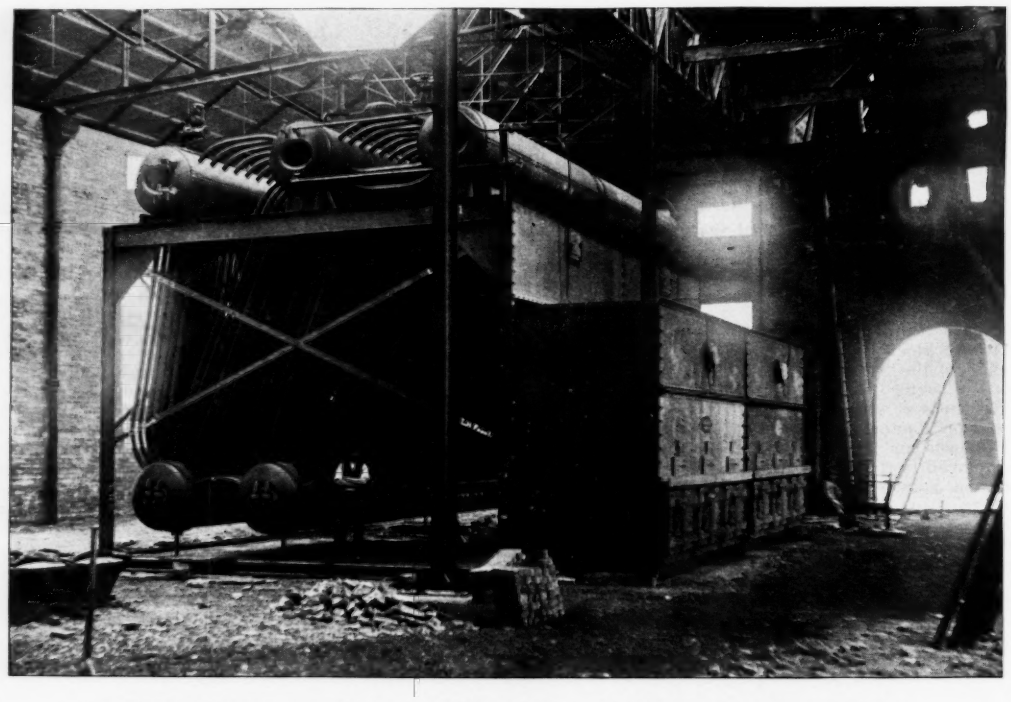
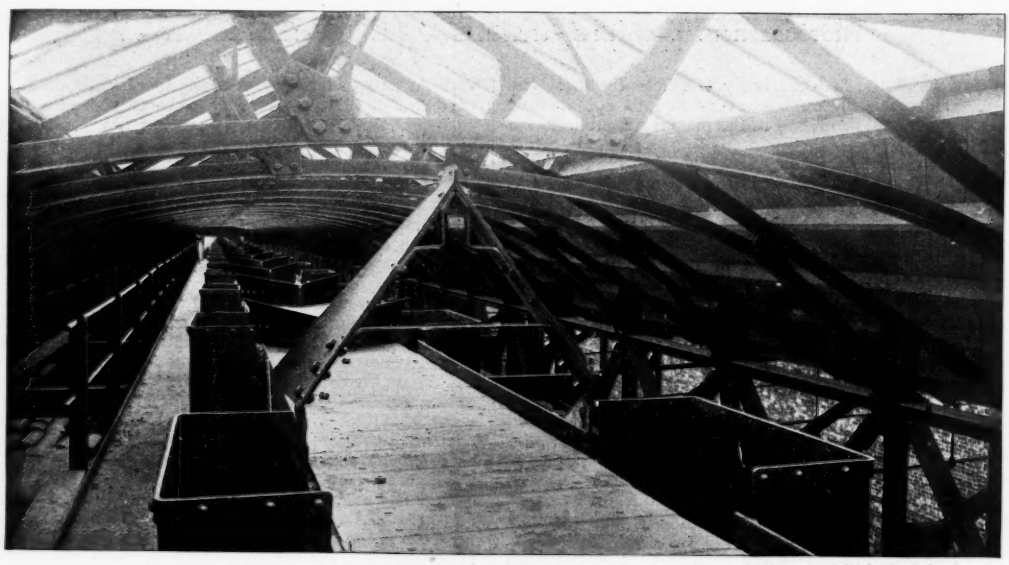


PHOTOGRAPH No. 83.—Sectional view of "Stirling" boiler, with steel casement for the gas producers.

the exhauster-house floor has avoided all trouble with regard to wet steam. The extensive length of steam-piping necessitated great care being exercised in its general arrangement, so as to permit of the free expansion and contraction of the piping without the disturbance of the joints. The system (in duplicate) consists of two lines of 12-inch welded-steel steam-tubing with flanged joints; large radius bends being employed in all cases in turning at any angle, so as to take advantage of the spring in such a form acting as an expansion joint. The direct line of piping from the boilers throughout the length of the coal-store and the plant-house is 440 feet. At the south end of the coal-store, provision is made for the taking up of the estimated 16 inches of expansion by means of a volute pipe, which in reality consists of a number of large-radius bends, with proper provision made at the bottom of the loop for the removal of condensed water. This is illustrated on Photograph No. 84.

The position in which this is placed, enables the expansion of the entire length from the boilers to the south end of the plant-house being taken up in this way. Thereafter, large-radius bends alone are depended upon to take up the expansion in the shorter lengths. The pipes are supported upon expansion rollers secured to brackets resting upon the transverse joists which support the coal-storing plant conveyor; similar means of supporting the pipes in the plant-house being adopted. In all other cases where supports for expansion rollers could not be conveniently arranged, the pipes have been suspended by means of clips and suspension rods to the roof or girders, or any convenient means of attachment above them; and experience has proved that our methods with regard to this system have been correct, as we have had no trouble with the steam-piping in any part of the works.

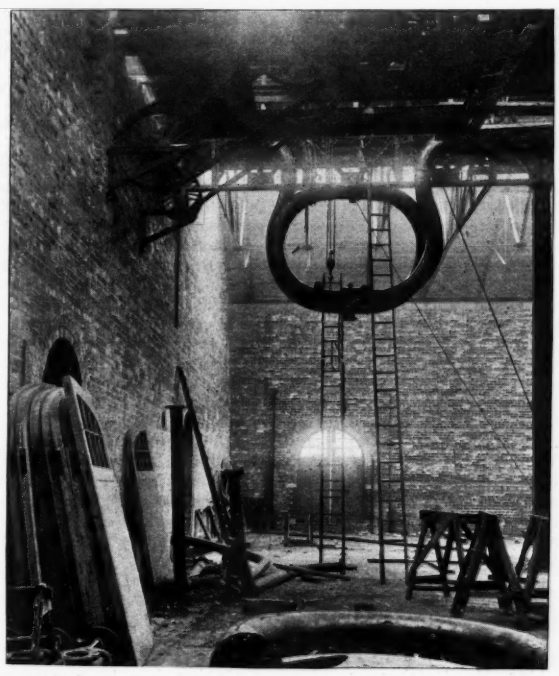
The main source of power for the coal-breaking, elevating and conveying plant, and the coke conveying, screening, storing, and loading plant—being all centred beneath the exhauster-house—made it necessary to take some precautions to ensure the rapid stopping of the engines in the event of a mishap either to the attendants or the machinery in any part of the system. The engines, it will be remembered, are situated some 600 feet away from the coke-handling plant, and the coal elevating and distributing plant in the retort-house is situated at such a height from the ground as to render such a precaution very necessary. I have, therefore, fitted the main engines with Tate's patent electric stop-motion; and I am happy to say it is a most successful device. It consists of an electrically moved stop-valve placed in any position near the engines, and which can be actuated by electric communication from any point of the plant where an electric push may be placed. Any number of these electric pushes, similar to electric-bell fittings, can be placed on the plant communicating with the one set of valves. They are covered by means of a little glass disc in a frame; and attached to the frame is a small iron hammer secured with a chain. In the event of a mishap to any part of the plant, or for any other reason, the operator, by just breaking the glass, communicates



PHOTOGRAPH No. 85.—Steel-plate coal-conveyor and adjustable ploughs in the coal-store roof.

electrically with the special stop-valve on the steam-pipe supplying the engine, which immediately runs down and shuts off the steam-supply altogether independent of the man in charge of the engines. The attendant at the coke-storing plant or the coke-conveyor, the coal-breaking plant, or those in attendance at the coal-bunkers in the roof of the retort-house can—should circumstances arise, necessitating their doing so—immediately stop the engines, though situated so far away from them. As a matter of fact, this appliance has already been found to be a most serviceable device—often preventing what might otherwise have proved a very serious mishap, by the timely stopping of the engines from points remote from the main source of power.

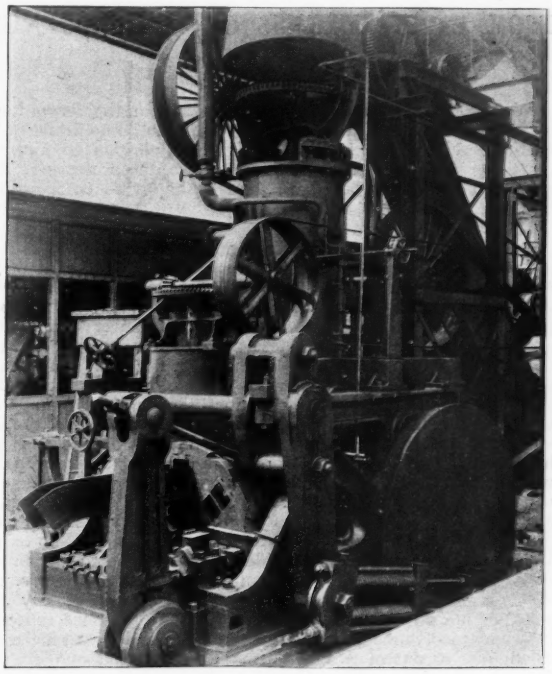
The coal-storing plant is arranged in a similar manner to the plant supplying the retort-house. It is shown on the same plan as the steam-generating plant. The waggons are upended by means of a hydraulic ram, the details of which are illustrated upon Plate 18, fig. 1. The ram is exactly similar to those already referred to in connection with the coal unloading plant for the retort-house. The movement of the ram raises one end of the waggon, causing the coal to descend from the waggon on to a 3-feet wide steel belt conveyor; this conveyor feeding through a single-roll crusher, which is intended to crack the larger pieces before they are allowed to fall into the boot of an inclined steel-plate elevator, 3 feet wide, rising at an angle of 33°, and entering the opening into the north tower of the coal-store block of buildings. Within the tower it discharges (as shown in the longitudinal elevation of the steam-generating plant) upon a 3-feet wide steel-belt conveyor which is accommodated within the central span of the



PHOTOGRAPH No. 84.—Steam expansion joints on the 12-inch main line of steam-piping.

coal-store roof—illustrated in Plate 18 and also in Photograph No. 85. This conveyor runs the full length of the coal-store; and the contents of the belt are thrown off by means of adjustable ploughs, which divert the stream of coal coming forward on the belt to either side, where the coal discharges through pockets and descends on to the stack below.

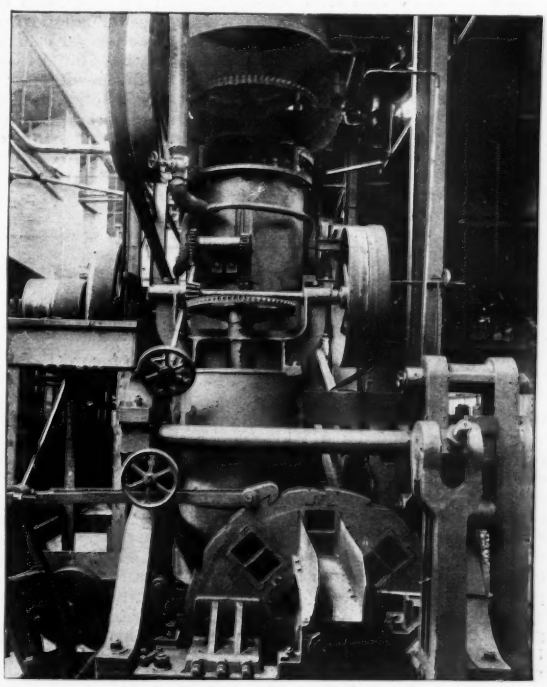
As already explained, the coal-store is self-filling to the extent of 7000 tons; but in the event of troublesome times threatening, the coal-conveyor can be made to discharge into tipping waggons, and, by trimming, the coal-store can be made to contain 11,000 tons. Nothing but soft common coal is stored under cover; the cannel is stored in the open yard enclosed within permanent walls built of the larger pieces in such a manner that the stock from the interior can be removed without disturbing the outer walls—these being left as a last resource. Some common coal is also stored out-of-doors. This, however, is of a hard character—almost as hard as cannel, and does not in any way deteriorate by exposure to atmospheric influences. Altogether a stock of about 25,000 tons is already in existence on the works—enough for about 25 days' maximum winter consumption. This is considered sufficient as a permanent stock. Should, however, at any time there be a chance of a general cessation of coal-mining throughout the country, sufficient time usually transpires to enable a large surplus stock to be put down in the open yard. Local troubles cannot seriously affect us, as we can import coal from Newcastle into Granton at a very little in excess of what we now pay for that locally mined.



PHOTOGRAPH No. 86.—Coke-dust briquette manufacturing plant; general view.

Coal-Dust Briquette Plant.

The briquette plant is located immediately alongside the boilers, and is shown upon Plate 18 as well as on Photographs Nos. 86 and 87. I do not propose, at the present stage, to enter very fully into a description of this plant. I may, however, say that it has proved to be capable of making 5 tons of briquettes per hour—the contract quantity; and it works in every way satisfactorily. The present time, however—with pitch at about 60s. a ton—is not the period when one can afford to manufacture briquettes from a material worth 2s. 6d. a ton. We have, therefore, done no more with this plant than prove its capacity by manufacturing 400 to 500 tons—sufficient to distribute as samples among our customers both at home and abroad.



PHOTOGRAPH No. 87.—Front view, showing the die plate and the discharging spouts of the briquette plant.

FROM EARLY VOLUMES OF THE "JOURNAL."

June 11, 1849.

We understand that a project is on foot for the formation of an Institution of Gas Engineers. There can be no doubt of the usefulness of such an institution, if properly organized, and promoted by parties enjoying the confidence of the profession. We shall rejoice at its success, and shall be happy to co-operate in its foundation.

Our advertising columns bear conclusive evidence of the declining value of gas property, and more especially of that of the Metropolitan Companies. Holders are rushing into the market willing to sacrifice their shares at discounts varying from 8 to 80 per cent. upon the sums paid up, terrified at the cry for "cheap gas," and foreboding nothing less than the entire destruction of their fortunes; and yet we see no cause for despair. The time is passed when, with suicidal jealousy, directors were busily cutting one another's throats by competition, and two companies would double their expenses and lower their prices out of mere spite. A more rational state of affairs now exists; and if shareholders, instead of taking alarm and sacrificing their property, would apply themselves to the removal of the petty jealousies which still interfere with the attainment of a closer union amongst the Metropolitan gas proprietary, they would, in our opinion, still find their property valuable. We hold out no tempting prospect of 10 per cent. dividends and handsome premiums on shares, or places for expectant directors, contractors, and officers, who always form an army in support of any new scheme; nor do we desire to see the railway miracles repeated, by which insolvent companies were made to smile with increased dividends, or out of two bad concerns one good one created, and, by the addition of one or two still worse, the whole appear better still.

On Wednesday evening, May 30, Mr. Staite again exhibited to the public generally the unrivalled brilliance of the new light [the electric light]. His apparatus for this occasion was carried to the summit of one of the piers of Hungerford Suspension Bridge —that, namely, on the Middlesex shore—and thence he threw the radiance of his magnificent discovery now along the bridge to the multitudes that watched from the Surrey shore the effects of the illumination, now along the buildings which form Hungerford Market, and now upon the water front of Somerset House, and upon Waterloo Bridge and steamers passing up the river. But, wheresoever it lighted, the beam dazzled the beholder, whilst it discovered to its controllers the minute characteristics both of dress and architecture. The power of the light is well known; but what is interesting to all who desire the progress of scientific discovery, and the application of it to the uses of society, is that Mr. Staite has been most successful in effecting and maintaining the relative adjustment of the two points, or opposite poles, which occasion the luminosity. This has been one grand desideratum, which, we believe, he has attained through means of the electric current itself, so that it is self-acting, and by apparatus even more economical of mechanic contrivance than we had the opportunity of witnessing. His efforts are now turned towards making his discovery economically applicable, and they have hitherto been most successful. It may be interesting to those who saw the brilliance of his light on Wednesday night—collected, as it was, into one focus by a reflector thrown behind—to know that the power of it is estimated at 750 candles. His apparatus constructed for domestic use gives a light equal to from 8 to 40 candles, with this singular advantage—that the blaze can be produced and retained under an air-tight glass shade, so as to prevent the possibility of ignition.—*Mining Journal.*

OBITUARY.

ANDREW STEPHENSON.

It is with considerable regret that we have to record the death, last Saturday morning, of Mr. Andrew Stephenson, who was for very many years well known by readers of the "JOURNAL" as the representative of the Gas Purification Company. His connection with the Company dates a long way back; he having occupied the position of Chemist, before he took up the travelling branch of the business. During this time he invented an apparatus for the purpose of testing spent oxide; and this is now in extensive use in gas-works. Masonic friends will remember that he was long a member of the Evening Star Lodge, though for personal reasons he did not pass the chair—his elder son being dangerously ill at the time when his installation as Master would have taken place. About four years ago, he suffered from an illness for which he underwent a serious operation, without, however, any good result. After that, he never recovered his health; but, on the contrary, got gradually worse, until, while attending the recent meeting of the Eastern Counties Gas Managers' Association at King's Lynn, he caught a chill, which was really the cause of his death. He took to his bed last Sunday week, suffering from jaundice, congestion of the lungs, and pleurisy, and got rapidly worse, until the end came at half-past six on Saturday morning, when, surrounded by al his family, he passed peacefully away. Mr. Stephenson leaves a widow, two sons, and three daughters to mourn his loss. The elder of the two sons, Mr. Sidney Osborn Stephenson, is the Engineer and Manager of the Tipton Gas-Works; while his brother, Mr. Harley Andrew Stephenson, is engaged in the London Office of the British Gaslight Company. He will also be greatly missed by the very large circle of friends both within and outside the gas profession, to whom his quiet, unobtrusive ways, his good humour, and his bright and well-informed conversation had endeared him. Of such a man, there is not a great deal that can be recorded; the good he does, is done, as it were, by stealth. But though Mr. Stephenson's works may not have been of the kind one finds inscribed upon the Roll of Fame, yet there are many gas managers who owe a great deal of their ultimate success in life to the assistance they received from him—especially with regard to the subject of purifying—at a time when knowledge on gas matters was not so easily come by as it is to-day. In the hearts of these and of all others with whom he came in contact, there will, we are sure, always remain a feeling of affection for the unostentatious man who has just gone from among them. Mr. Stephenson was born at Kilrush, in Ireland, on Sept. 3, 1843; so that he was 59 years old at the time of his death. The funeral is fixed to take place, at 12.30 on Thursday, at the West Ham Cemetery; and it was the deceased's special wish that the last sad rites should be performed in the quietest possible manner, and that there should be no wreaths or flowers of any kind.

The death occurred on Monday of last week, at the age of 68, of Mr. JOHN CRITCHLEY, who for six years occupied the position of Chairman of the Chorley Corporation Gas Committee.

The death took place, on Monday of last week, with great suddenness, of Mr. WILLIAM FERGUSSON, who had for over 24 years occupied the position of Gas and Water Manager to the Barrow Corporation. Deceased, who was in his 64th year, had been in failing health for a long time; but in spite of this, he continued to attend to his duties. In the afternoon of the day on which he died, he was present at a Committee meeting, where he was able to transact the customary business; and on returning to the office he completed his work, and left for home at six o'clock —two hours earlier than was his usual practice. He was quite cheerful during the evening; but at half-past eleven o'clock he appeared to have been seized with a sudden illness, for he experienced great difficulty in breathing. Medical aid was summoned; but ere the doctor arrived, Mr. Fergusson had passed quietly away. Deceased was twice married, and leaves a widow and a large family, all of the second marriage, excepting Mr. William Fergusson, who has been Assistant-Manager under his father for a long time. Mr. Fergusson went to Barrow from Sheffield, where for 2½ years he had occupied the position of Works' Superintendent. Previous to that, he spent 22 years in the employ of the Gaslight and Coke Company, to whom he was articled at the age of 14 years. Deceased was highly respected in Barrow; and there were a very large number of persons present at the funeral, which took place last Friday at the Borough Cemetery.

PERSONAL.

Mr. M. B. WATSON, of West Calder, has been appointed Manager of the Auchterarder Gas Company, in succession to Mr. James Dawson. There were thirty applicants.

Mr. H. A. DIX has resigned his position as Manager of the Cray reservoir works of the Swansea Corporation; and Mr. M'KENZIE has been temporarily appointed in his place.

Mr. JESSE HALL, who has been Manager of the St. Andrews Gas Company since 1850, has been appointed Chairman of the local School Board, in succession to the late Provost J. Ritchie Welch. Mr. Hall has been a member of the School Board since its institution in 1872.

Mr. C. F. KENT, the Manager of the Kingswinford Gas-Works, having accepted a similar position at Woburn (Beds.), the Directors of the Brierley Hill Gas Company, to whom the Kingswinford works belong, have appointed the foreman, Mr. A. SKELDING, to fill the vacancy, under the supervision of their Gas Engineer and Manager (Mr. W. C. Jones).

Mr. WILLIAM ARGENTINE VALON, a son of Mr. W. A. Valon, who last year took the First Prize and Silver Medal in the Ordinary Grade of the City and Guilds of London examination in "Gas Manufacture," has just successfully passed the examination of students of the Institution of Civil Engineers. Mr. Valon served his apprenticeship to Mr. John Morrison, at Sheffield.

In the list of students who passed in constitutional law and legal history at the Easter examination of students of the Inns of Court, appears, in Class I., the name of Mr. JACQUES ABADY, of the firm of Messrs. Alex. Wright and Co., Limited. We heartily congratulate Mr. Abady, and more especially on the footnote to the list which states that the special prize was not awarded; but "Mr. Abady would have been recommended for it had he not been disqualified by age."

COMMUNICATED ARTICLES.

UTILIZING WATER GAS IN THE PRODUCTION OF ILLUMINATING AND HEATING GASES.

By William Young, of Peebles.

At the meeting of the North British Association of Gas Managers held in Edinburgh, July, 1900, the writer contributed a paper consisting of jottings on the principles involved in the production of gas by different processes.* Owing to the state of his health, that paper was neither read nor discussed; and as the jottings had, and have, a direct bearing upon the subject of the interesting correspondence that has recently been taking place in your pages regarding the production of blue water gas, and its carburation by various means, it has occurred to the writer that it might be desirable to bring the views then expressed to the notice of your readers, with such additional remarks as further developments have suggested.

The motive mainly prompting the making of the communication in question was the most interesting articles that had been appearing in your pages in reference to the Dellwik process—more particularly those by Professor V. B. Lewes, dealing with the principles and the results from that system, and with the various methods of using blue water gas in conjunction with the carbonization of bituminous coal in the manufacture of illuminating gas. In these jottings, consideration was first given to the principle upon which the Dellwik process was founded; this was admittedly sound. But attention was drawn to some practical difficulties in the application of that principle, which the Dellwik apparatus was not designed to overcome, and also to some conditions inherent to the process precluding the theoretically perfect results claimed for it. Practical experience of the working of the system has gone to support the views then expressed.

Attention was next directed to the fact that, while the principle of the process of utilizing the whole heat energy of the combustion of the carbon in the coke for the production of blue water gas was original and meritorious, the principle of the process had been previously well known, and even applied (to a modified extent) in the Lowe carburetted water-gas process; and that in a paper read before the Incorporated Institution of Gas Engineers in 1893, Mr. A. G. Glasgow had explained that, by modifying the depth of fuel in the producer in relation to the blast pressure, the relative proportion of carbon in the fuel burned in the producer to carbon monoxide and dioxide could be modified, so as to leave a greater or less amount of heat in the producer for the production of water gas, dependent upon the heat energy required in the carburetting chambers. With this knowledge, the inference was that it was only a step further, when no work was required to be done in the carburetting chambers, to adjust the correct relations between the depth of fuel in the producer and the air-blast, and thus to convert the producer of the Lowe plant to work upon the Dellwik principle. As the producers in the Lowe and in the Dellwik plants are practically identical in construction, the results, when worked under like conditions, should also be practically the same; and it would appear from the correspondence in your pages that this has been the natural evolution of the use of the Lowe plant.

The second jotting had reference to destructive distillation, and more particularly destructive distillation of hydrocarbonaceous substances in the presence of an inert gas, such as blue water gas; and it is this point to which it is desired to draw special attention. Briefly stated, it was explained that it had been frequently asserted that, when a hydrocarbonaceous substance, such as mineral oil, was cracked up in the presence of an inert gas, like water gas, it yielded a higher enriching value than that which could be obtained from the same oil when the vapours were cracked up by themselves. It was explained that the results obtained from the Peebles process had demonstrated that this was not the case; that the presence of an inert gas, or its equivalent, had not only no beneficial effect, but the reverse; and that it retarded and prevented the cracking up of the oil vapours, and interfered with their gasification in a way that reduced, rather than increased, the enriching value of the resulting gasified vapours—not by a chilling action, as had been supposed, but by a diluting action preventing the same amount of decomposition or cracking up of the oil vapours, and to overcome which involves the use of such a high temperature as to be injurious.

So far as the writer is aware, in all the carburetted water-gas processes in which externally-heated retorts have been employed to crack up the oils, the vapours have been diffused through the blue water gas while being cracked up, just as when cracked up by means of the heated checker-work in a Lowe plant. In no case have the oil vapours been fractionally cracked in separate retorts in accordance with the Peebles principle; the blue water gas being only brought into contact with the fractionally cracked-up oil products after leaving the retort, and employed to carry away the portions sufficiently gasified, where the ungasified portions were repeatedly returned to the retort to undergo further cracking, till the whole of it was gasified and carried away, and nothing but the surplus carbon left in the retort. Such a process is very different from the Lowe system, where a considerable proportion of the carbon from the cracking up of the oil vapours is left upon the surface of the brick checker-work, the remainder being left either held in suspension or otherwise in chemical combination with the hydrogen in the tars.

The relatively larger proportion of the oils gasified, and the constitution of the gasified products and of the residues, leaves little doubt but that the oils cracked in accordance with the Peebles process or principle will give greater enrichment value, both as to illuminating and heating power—more particularly the latter—than the same oils cracked up by the Lowe process. And when poor coal gas, such as that obtained from coal slack, can be produced at a low cost, and it is necessary to enrich it up to a standard illuminating or heating power, there is no doubt about the advantages of the Peebles principle of cracking up the oils, as every unit volume of gasified oil vapours added to the poor coal gas contributes its equivalent of enrichment, whereas when the oils are cracked up mixed with the water gas a considerable percentage of the gasified oil vapours are required to confer upon the blue water gas any luminosity whatever, before they are available for enriching the coal gas with which they are to be mixed. When, however, coal gas is costly to produce, and volume of gas is an object, it is possible that the principle of being able to utilize a part of the unavoidable waste heat from the producer to crack up the oil vapours in accordance with the Lowe process may counterbalance the greater enriching value obtained from the cracking up of the oils by the Peebles system.

It was further explained that similar remarks applied to the destructive distillation of coal—that the introduction of blue water gas among the coal products during the carbonizing process acted in a similar manner; and, as directly bearing upon the subject, reference was made to some early personal experiences in connection with a process patented by Mr. Henry Aitken and the writer in 1875, in which blue water gas or other poor gas was used in conjunction with the carbonizing of coal. [The portions of the specification, and the drawings, which are indicated by our correspondent as being of more special interest, are given in an Appendix to this article.]

It will be observed from the specification that, although the method of producing the supply of blue water gas was different from the present, yet both the constitution of the gas and the methods of utilizing it were practically the same as those that have been receiving so much attention. The one method was substantially identical with that now associated with the name of Professor Lewes—viz., the water gas, after being condensed and measured, is passed into, and through, the vacuous space above the coal being carbonized in the retort; the combined gases being thereafter subjected to a fractional condensing process. By the other method, the blue water gas was not passed through the retort, but was only mixed with the warm coal gas and products after leaving the retort, in a manner corresponding to the present-day method of introducing the blue water gas into the hydraulic main, and submitting the mixed gases and products to condensation.

It will be evident to those who have given thought to this subject—and still more to those who have been, and are, engaged in making trials of the different methods of using water gas—that the arrangements shown are well designed to test whether or not the enrichment obtained was due to the action of the water gas passing through the retort modifying the nature of the decomposition of the volatile products from the coal; as, by both methods, the system of condensation would ensure that the whole of the volatile hydrocarbons produced from the coal would be passed into the blue water gas, and not left in the tars. A large number of careful experiments made at the time showed that the gain in illuminating power from a given coal by either method was practically identical.

Since those early experiences in the use of blue water gas, the writer has had further practical experience in various ways, but particularly in the kindred industry of carbonizing shale for the production of paraffin oils, in which many thousands of millions of cubic feet of water gas have passed through the retorts among the carbonizing shale, and in which the blue water gas after condensation was treated with solvent oils for the absorption of the volatile vapours and their recovery as naphtha. All this experience would clearly go to show that the sole function performed by the blue water gas in passing through the retorts during the carbonizing process was to protect the liberated products from decomposition—a most useful function, when the object is to produce liquid hydrocarbon products, but the reverse of useful or beneficial when the object is to crack up these hydrocarbons and gasify them.

Referring to the results claimed to have been obtained from passing the blue water gas through the retorts during the carbonizing of the coal, it may be remarked that, seeing the action of the blue water gas is conservative—that is, that it protects the hydrocarbon vapours from the coal from excessive decomposition—it will be equivalent to a reduction of the temperature of carbonization; and therefore the volume of gas produced from the coal will not be increased, but rather reduced. And as the only other source of increased volume that could come from the coal would be got by the blue water gas taking up in diffusion the vapours of the hydrocarbons that would otherwise be condensed and carried away by the tars, and as the total volume of these

* See "Journal," Vol. LXXVI., p. 282.

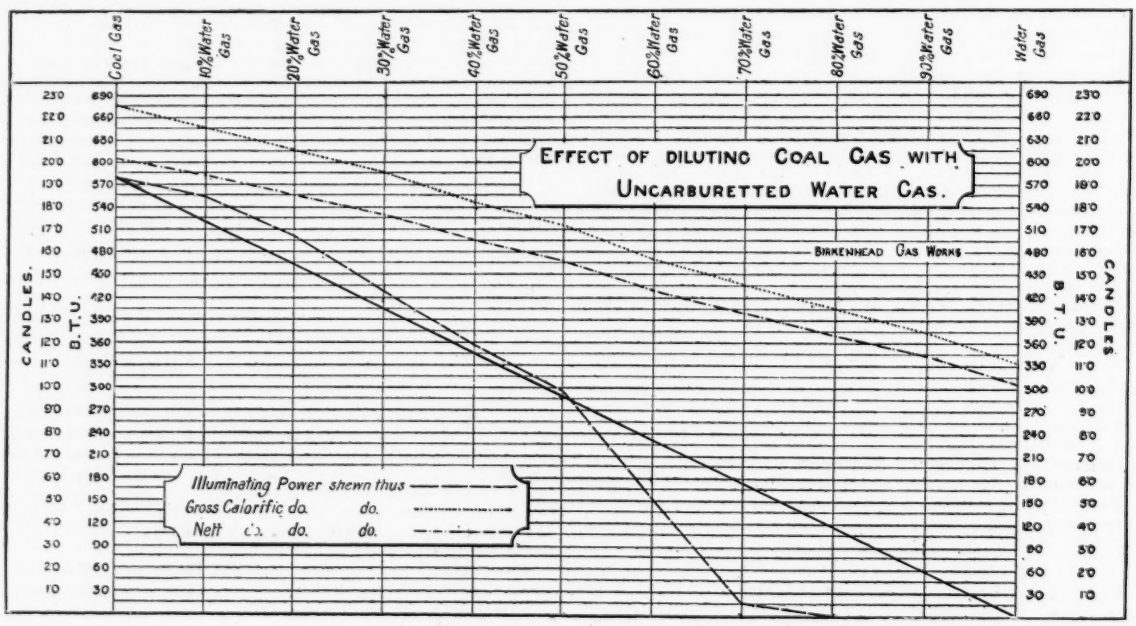
vapours from a ton of coal cannot exceed 20 cubic feet, it is obvious that there must have been some error in calculating the very large gain in volume stated to have been obtained from the coal by this method of using blue water gas.

With regard to the increased illuminating power obtained by the use of blue water gas in conjunction with the carbonizing of coal and admixture with other gases, it is more than twenty years since the writer demonstrated to the North British Association of Gas Managers—by means of various samples of gases, all of them containing exactly the same weights of carbon and hydrogen—that there was no necessary relationship between the heating and illuminating power of gases; and that the same weights of carbon and hydrogen, when differently combined or associated in the gaseous state, gave very different illuminating powers, and even different calorific values per unit weight of carbon and hydrogen present in the gases. Luminosity is a mode of heat energy depending mainly upon the power possessed by the substance being heated to convert the long waves of heat energy into short or rapid waves of luminosity. Blue water gas contains no such substance, and hence its flame is non-luminous. When, however, the gas is mixed with coal gas in limited proportions, and the mixture consumed under appropriate conditions, the blue water gas, by its high temperature of combustion, assists in the decomposition of the hydrocarbons present in the coal gas, and liberates free carbon; and this carbon converts an additional part of the heat energy of the flame into luminosity. Hence when blue water gas is simply mixed with a rich coal gas, the gross luminosity or candle-feet is greater than that of the diluted gas alone. When, however, the water gas added exceeds a certain percentage, dependent upon the quality of the coal gas, it so retards or prevents decomposition in the flame (just as it does during the carbonizing process in the retort), that the carbon is not so freely liberated, and the luminosity is proportionately reduced.

The accompanying diagram, showing the results of experiments made to determine the effect of diluting coal gas with blue water gas, and given with his able address to the Incorporated Gas Institute at their meeting in 1901 by Mr. T. O. Paterson, very clearly illustrates this point.

It will be observed from the straight line drawn from the zero of illuminating power to that of the undiluted coal gas, that the illuminating power of the mixed gases is above the mean till about 50 per cent. of blue water gas is added, when further dilution reduces the illuminating power at a greater rate than the mean, till, on 80 per cent. being reached, the luminosity of the coal gas is destroyed. Now it is evident that, if the blue water gas (prior to being mixed with the coal gas) had been brought into contact under suitable conditions with the warm tars condensed out of the coal gas, the water gas would have taken up in diffusion a proportion of the more volatile hydrocarbon left in those tars dependent upon the volume of the water gas. The greater the proportion of vapours left in the tars, the larger the volume of blue water gas required to take them up and carry them away. It will be further obvious that the blue water gas, so carburetted with the vapours from the tars, would give a proportionately higher mean illuminating power than that shown on the diagram, and that the percentage volume of blue water gas would be proportionately greater before the maximum mean luminosity was reached. These facts point to the reason why there is obtained a gradual percentage gain in candle-feet per ton of coal as the quality of the coal improves with increased volume of blue water gas up to a certain percentage volume, and why it decreases when this volume is exceeded. They would further indicate that, to obtain these results, it is neither necessary nor desirable to pass the blue water gas through the retort in which the coal is being carbonized.

There is little doubt that, had the Dellwik process of producing water gas at low cost been in existence in 1875, the method of using water gas in conjunction with coal gas, and more especially cannel gas, in the manner described in the patent referred to, might have been a commercial success. But water gas was costly to produce by the then known methods; and when poor coal gas was used to take up the hydrocarbon vapours from the cannels, it was found that, to produce the high qualities of gas then in use in Scotland, the quantity of vapours required to be put into the coal gas was so large that they condensed out of the gas during distribution—more particularly in the dry meters, owing to the



solvent action of the oils in the leather. The process therefore fell into disuse.

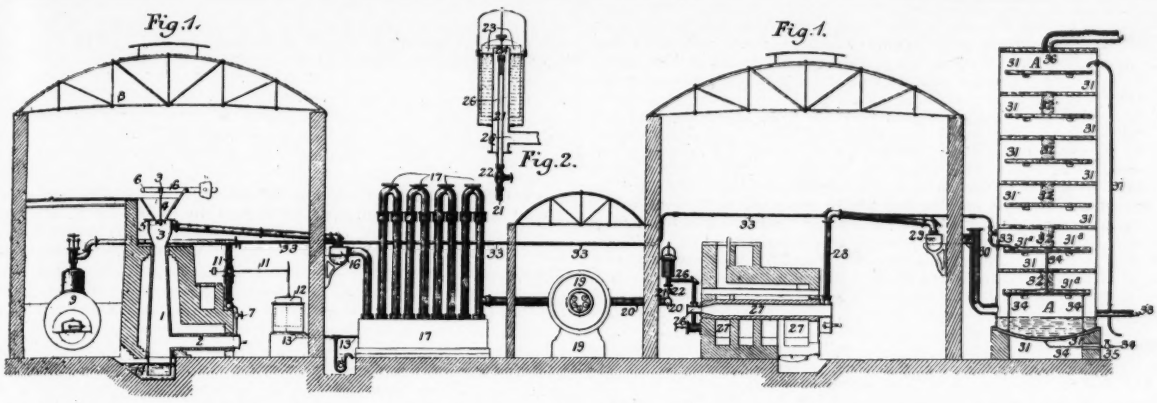
These facts should, however, be kept in view in the further development of processes for the utilization of the cheaply produced water gas by the Dellwik principle; and in estimating the relative values of gases produced by different methods, their permanency should be carefully considered. The condensed matters deposited in the compensating holder and upon the surface of the purifying materials, would indicate that the Lowe method of cracking up the oils for carburetting purposes is defective in regard to permanency. The separate production and storage of the blue water gas on the Dellwik principle, and its subsequent carburation by the products from the coal or by cracked-up gasified oils, ensures greater permanency and greater economy of carburetting materials, and certainly gives greater elasticity to its employment.

Appendix.

Extracts from Patent No. 2725 of 1875, for "Improvements in the Manufacture of Illuminating Gas, and in the Apparatus employed therefor."—Henry Aitken, of Falkirk, and William Young, of Clippens.

Our said invention, which relates to improvements in the manufacture of illuminating gas, has for its object as follows; Firstly, to effect the more perfect and complete application for the manufacture of illuminating gas of the liquid volatile hydrocarbons produced and ordinarily left in the tars when coal, shale, hydrocarbon oils, resin, or other similar bituminous substances are destructively distilled for the production of illuminating gas.

The accomplishment of the aforesaid objects constitutes essentially the practical working of what is well known to gas engineers as the "hydrocarbon process." The difficulty hitherto experienced in the practical or commercial working of the "hydrocarbon process" has principally been the production of a gas having a uniform illuminating power; this difficulty arising from the want of efficient means for regulating the supply of hydrogen or other gas necessary to take up the hydrocarbons produced from the bituminous substance as it undergoes distillation. With any of the forms or arrangements of apparatus hitherto employed, it has been essential that the water gas should be passed into the bituminous retort while the bituminous substance is undergoing distillation, or mingled with the warm crude bituminous gases as they are produced, and in as near as possible the proportion necessary to combine at once with the hydrocarbon vapours as they are produced from the bituminous substance; for, in the event of the water gas being in too large a quantity, the resulting mixed gases have been deteriorated in their illuminating power by diluting the bituminous gases too much. On the other hand, in the event of the water gas being deficient in quantity, the hydrocarbons have not all been taken up and diffused through the mixed gases, and have therefore been condensed and removed by the tars. As, during the distillation of a charge



of coal, the hydrocarbons produced suitable for being so taken up by water gas are constantly altering in quantity—being most abundant at the early stages of the distillation, and gradually diminishing until in the latter stages they are almost entirely wanting—it is easily perceived that considerable difficulty occurs in regulating the supply of water gas. By this invention, these defects are obviated, or in great measure modified, and the "hydrocarbon process" made a valuable one by utilizing the means hereinafter described.

Fig. 1 is a section, partly in elevation, of an arrangement of apparatus for the manufacture of water gas (hydrogen and carbonic oxide) or other gas having a low illuminating power in one set of retorts, which is afterwards passed through a second set of retorts, in which bituminous coal or other similar substance is being distilled, and the combined gases subjected to the action of the analyzer or fractional condensing arrangement.

The retorts 1 and 2 for the production of the water gas or other poor gas are set in a vertical position and heated by a furnace placed at one side, but which is not shown in the drawing. The carbon necessary for the decomposition of the water is introduced by the hopper and valve arrangement 3, by filling the hopper 4, and then opening the valve 5 by depressing the lever 6, when the coke or other carbonaceous matter falls into the retort. The retort 1 is kept at a very high temperature, and steam is admitted thereinto in a regulated stream by the valve 7, communicating with the main steam-pipe 8, led from the steam-boiler 9. On this main steam-pipe 8, there is placed a regulating valve 10, actuated by the lever 11, connected to a small governing gasholder 12, which, being raised or lowered by the pressure of the gas passed by the pipe 13, regulates the quantity of steam to be admitted for the production of the necessary quantity of hydrogen.

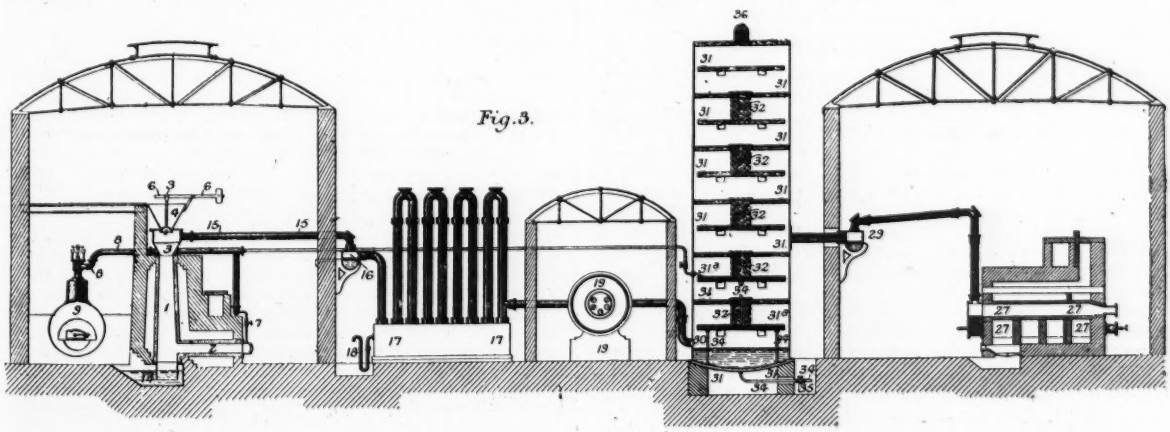
The horizontal portion of the retort 2 may be either filled with coke or fire-brick, the purpose of introducing which is more especially to prepare the steam, by heating it, for after-decomposition rather than to decompose it. The water-trough 14, at the bottom, and into which the retort 1 dips, seals it, and at the same time allows the ashes resulting from the carbonaceous matter imtroduced into the retort to be removed. The steam, after being heated in the horizontal portion of the retort 2, passes up through the coke or carbonaceous matter into the body of the retort 1, where it is decomposed into water gas, and is then drawn off by the outlet-pipe 15, and passed to the hydraulic main 16 and condensers 17, wherein any water which may have escaped decomposition is condensed and removed by the pipe 18. Should the carbon employed for decomposing the water contain sulphur, the gas may be also purified to remove sulphur compounds present; and after being so purified, it is passed through the meter 19 to be measured, and thence to the main pipe 20, for supplying the bituminous gas-retorts 27.

The bituminous gas-retorts 27 may be of the ordinary horizontal description. The water gas or other poor gas is admitted to the bituminous retorts by the pipes 21 and 26 leading from the main gas-pipe 20, through the screw valve 22. To admit the water-gas automatically, the apparatus shown on an enlarged scale at fig. 2 is employed; this being so constructed that the pressure of the gas on the retort being charged lifts the small gasholder 23, which actuates the valve 24, covering the pipe 21, and thereby allows the water gas, which is kept or made under a considerably greater pressure, to pass by the pipe 26 to the bituminous retort. On the pressure being removed from the retort, the small holder 23 at once falls and shuts off the supply of water gas.

The mixed bituminous and water gases pass off by the standpipe 28 to the hydraulic-main 29, and thence, by the pipe 30, to the analyzer or fractional condenser A. The fractional condenser shown in fig. 1, is considered by us to be among the best forms of this apparatus; and it is very similar to the ordinary "Coffey still" analyzer. This analyzing arrangement consists, as will be seen on referring to the drawings, of a vertical tower or chamber having tray-diaphragms 31, placed at intervals and so arranged that the gases in their passage between these trays are caused to travel in a tortuous course alternately from the sides to the centre; the apertures through which the gas has to pass being alternately at the sides and the centre of the trays. Hanging from the edges of the central part of the trays, and dipping into the tars in the trays underneath are tubes of wire-gauze 32, perforated metal, or an equivalent porous arrangement may be adopted. Two of the lower trays 31^a and bottom 31 of the tower are shown cased or doubled (but more of the trays may also be so constructed); and into this space steam is admitted by the pipe 33 connected to the steam-boiler 9, and the condensed water is drawn off by the pipe 34 and valve 35.

The combined bituminous gases and water gases or other non-luminous gases, with the suspended crude tars, on entering the fractional analyzer or condenser by the pipe 30, pass under the lowest tray 31^a, and over the surface of the heated tars in the bottom of the analyzer, and so that they are bathed in a large volume of the comparatively volatile vapours of the hydrocarbons given off from the heated tars, which causes the heavy tarry particles suspended in the crude gases to be partially deposited. The gases then travel over the first tray 31^a, and through the wire-gauze tube 32, hanging from the edges of the aperture in the second tray 31. This effects a further separation of the mechanically suspended tars; and at the same time the gases receive lighter hydrocarbon vapours from the tars flowing over the wire-gauze 32 from the second tray. This process is repeated by the passing of the gases through the second wire gauze and over the surface of the heated tars contained in the third tray, and so on on ascending from tray to tray. The tars contained in the succeeding trays are successively heated to a less degree. The ascending gases becoming gradually cooled, deposit heavy hydrocarbon vapours and receive lighter ones until, by the time they reach the outlet-pipe 36 leading to the scrubbers, they have parted with all, or nearly all, their tarry particles, and only contain those vapours of hydrocarbons diffused through them, most of which remain permanently suspended—a small portion only being removed by the scrubbers, which is again returned by the pipe 37 to be used in carburetting a fresh quantity of gas. At the same time that the gases are being deprived of tarry particles and receiving volatile vapours, the deposited tars and condensed heavy hydrocarbon vapours descend from tray to tray, and, as already described, re-part with any absorbed vapours sufficiently volatile to the ascending current of gas, until, by the time the tars reach the bottom, they are almost or practically denuded of volatile hydrocarbons, and pass away by the pipe 38 to the tar-tanks.

Fig. 3 is a section, with part in elevation, showing an arrangement for the production in separate retorts of the bituminous and non-luminous gases, and for the simultaneous and separate treatment of both gases in a combined analyzing arrangement. The water gas and bituminous gas retorts and the analyzer are similar in construction to those hereinbefore described in reference to fig. 1, and similar numbers refer to similar parts of the apparatus. The gases are also produced in a similar manner; but instead of combining the different gases in the



bituminous retorts, they are kept separate and carried into the analyzer in two separate currents—the crude bituminous gases and tars being introduced (as shown) by the pipe 30, between the fourth and fifth tray from the bottom of the analyzer A; and at the same time the water gas or other poor gas is introduced, by the pipe 20, at or near the bottom of the analyzer. Both gases pass upwards from where they are admitted. The bituminous gases as they enter from the hydraulic main 29, by the pipe 30, are warm, and are further raised in temperature by the heat of the water gas rising up from below. The mingled gases are thus subjected to the analyzing action hereinbefore described, in their tortuous passage through the higher trays and wire-gauze tubes in the analyzer. At the same time the tars and condensible heavy vapours deposited from the gas in the upper portion of the analyzer fall back from tray to tray until they drop through into the trays 31A in the lower part of the analyzer, wherein they are heated by the steam, as above described. At this place, the heated tars are acted upon by the incoming current of water gases or other poor gases; and any traces of hydrocarbons remaining in the tars, and which are sufficiently volatile, are taken up by the gas, and the tars pass away denuded, as far as practicable, by the pipe 36 leading to the tar-tank.

Although in carrying out this invention it is not essential that the water gases and bituminous gases be made at the same time, because the action of the analyzer upon the gases is such that considerable variations may be made between the proportion of the bituminous and non-luminous gases at the instant of their production—for should the quantity of hydrogen or other non-luminous gas be insufficient to take up the whole of the hydrocarbons produced together with the bituminous gas at the time, the surplus falls back into the trays of the analyzer—and, on the other hand, when the hydrogen or other non-luminous gas is more than sufficient to take up the hydrocarbons from the bituminous gases simultaneously produced, then the previously condensed surplus hydrocarbon vapours contained in the trays serve to supply this deficiency. The variations in the proportions of the gases are in this manner practically balanced by the action of the analyzer. Yet, where it can conveniently be done, it is better that the water gas should be passed into the bottom of the combined analyzer in as regular a proportion as possible to the bituminous gases, so as to meet the stream of crude tars contained in the surplus hydrocarbons as they drop from the portion of the analyzer in which the bituminous gases are analyzed and condensed; or, where it is desirable to analyze the mixed gases, the water gas should be passed into the retort containing the bituminous matter, and there mingled with the crude bituminous gases as they are eliminated, as it appears the poor gases serve to shield from over-decomposition the hydrocarbons present in the crude bituminous gases suitable for carburetting the poor gases. Therefore, in adding the poor or water gases ascertained to be necessary to take up the hydrocarbons from the bituminous substance and form the quality of gas desired, the valves for admitting the water gas, or the steam for its production, or other poor gas, should be regulated to pass as near as possible the average necessary quantity during the distillation of the weighed bituminous substance. A very short time will suffice to do this—checking the quantity added by the meter measuring the water or other poor gas alone, or by taking the gross quantity of mixed gases passed through the ordinary station-meter.

MASSACHUSETTS GAS AND ELECTRIC LIGHTING.

By FREDERIC EGNER.

[A Review of the Eighteenth Annual Report of the Board of Gas and Electric Light Commissioners of Massachusetts.*]

Of those who read the text of the Bill creating a Gas Commission for the State of Massachusetts, which appeared in the "American Gaslight Journal" for Aug. 17, 1885, there were few who, if they gave the matter any thought at all, did not entertain some doubt as to the wisdom of the measure. A healthy publicity of anything appertaining to the gas business was then, and is still in some quarters, decried and "vigorously" discouraged. It was not, however, many years after the Commission was fairly inaugurated that the most advanced thinkers in our profession recognized its worth and utility.

Attentive gas men were not long left in doubt as to the position or attitude the Gas Commissioners of Massachusetts proposed to take professionally; for, though unofficially, they were represented at every meeting of any consequence held by gas men. Evidently they wished to gain as thorough a knowledge of the business as possible; and they did not stop at becoming acquainted with American, but also included European, conditions affecting the industry in general. And there is to-day probably not one man better posted upon the whole subject, or able to give a more reliable judgment in connection with the gas interests in both hemispheres, than the able Chairman of the Board, Mr. Forrest E. Barker. On the whole, the Massachusetts authorities seem to have been exceptionally fortunate in the selection of the *personnel* of their Gas Commission, who in turn seem not only to have entirely fulfilled the expectations of the wise framers of that measure eighteen years ago, but to have so conducted their office as to make themselves noteworthy examples for all who, in course of time, may come after them.

Let us now look over the contents of the last published annual report (the 18th) of the Commissioners. We shall find some instructive reading therein. For those who do not care for particulars—who are interested in "results" only—the condition of the gas industry in the State of Massachusetts may be summarized as follows for the fiscal year ending June 30, 1902:—

Total assets		$39,917,185·52
Total liabilities	$29,996,405·05	
Reserve and depreciation funds .	868,167·42	
Surplus	9,052,613·05	$39,917,185·52

These figures embrace the financial operations and standing of the 72 (or 74) gas companies in the State, of whom 24 are also operating electric plants. When it is said that, according to this report, five of the Companies "appear not to have earned expenses, and seventeen others have not earned sufficient to warrant the declaration of any dividend," it must be admitted that the gas business in Massachusetts is in a financial condition good enough to make investments in it not altogether unattractive. Of these 72 (or 74) gas plants, 65 furnish coal and water gas, 5 oil gas, and 2 acetylene gas.

It may be mentioned that 17 municipalities in the State have gone into the lighting business on their own account, in connection with which the attention of the New York law makers is respectfully invited, to make a close inspection of the figures submitted. New York dailies have during the past month or more agitated the subject of a municipal lighting plant, *more especially with a view to electric lighting*. These efforts of the papers referred to are probably not so disinterested as they appear to the reading public; though in whose interest the apparent opposition to the existing lighting companies of New York City these attacks were made, the writer will not undertake to say. But, while he would personally be much pleased to be entrusted with the office of designing, erecting, and perhaps running such a plant for the city, should the Municipality eventually engage in such a folly as to go into that business, he would, in advance, earnestly recommend representatives of the people and the taxpayers to carefully scan the actual results obtained in that line in the enlightened and well-governed State of Massachusetts, as disclosed by the report under review. It would probably make very clear to the said taxpayers that the great benefits accruing from the establishment of municipal lighting plants, especially the electric branch, are very much one-sided—viz., leaning altogether in favour of the people who have electrical appliances to sell, and who, now that private enterprise is pretty well supplied, work most diligently to create a new market for their goods, selecting the "dear public" this time as the prospective "beneficiaries."

The total investment on municipal account is given as $1,828,708; and the total loss on operating account for the electric plants (17) as $61,305·04. The gas plants, on the other hand, show the wonderful (?) net gain for the year of $3615·13. The actual cost per arc lamp, ranging from so-called 1200 to 2000 candle power lamps, is, to these towns, from $42 to $131 per annum apiece, with the more prevailing rates ranging from $76·91 to $86·03 per lamp. The gas sold to consumers is divided up as follows: 5,940,541,421 cubic feet of coal and water gas furnished by 66 companies, one of which formerly supplied oil gas only; 6,210,630 cubic feet of oil gas, furnished by five companies, one of these having left the oil gas and gone into water gas business and is included in the above 66; and 69,430 cubic feet of acetylene gas, supplied by two companies. The percentage increase in the sales of gas ranges from 1·95 (Ipswich) to 25·73 (Lawrence), with one abnormal exception—viz., an increase of 80·05 per cent. at Gardner. On the whole, the increase throughout the State seems to be a healthy one, and closely approximates to that noticed in other Eastern cities. The price charged per 1000 cubic feet for oil gas was from $4·29 to $4·83 net, and for acetylene gas from $12·50 to $13·50 net. The former reported as "unaccounted for" from 6·79 to 9·52 per cent.; while the acetylene showed a loss as high as 27·22 per cent. in one case. The unaccounted-for gas of the other companies ranges from 2·40 to 37·49 per cent.—these two being extremes, and the rest being more in accord with general experience under that heading. The illuminating power of the oil gas ranged from 37 to 48·15 candles; and that of the coal and water gas from 16·20 to 24·75 candles. The power of the acetylene gas is not given.

The writer has selected certain data from the reports of seven localities as giving a good, fair idea of the best average work done throughout the State, as well as the relative condition of the business. These figures are shown in the accompanying table; and, as stated, they are taken from the report. As it would serve no useful purpose, the cities are designated by numbers only.

By scanning the table, the reader will observe some facts persistently and regularly overlooked by gas consumers in rural districts; and the writer hopes to be excused if he calls attention to some of the more prominent features of general utility shown by the data given. No. 1, line A, represents evidently only a small place, though, unlike others of similar proportions throughout America, it has many manufacturing establishments; there being fully forty carriage works, besides woollen and cotton mills. No. 2 is something of the same order; only that its principal business interests are the manufacture of boots and shoes. But, note the number of consumers per mile of main, and compare it with No. 3, which has a population largely engaged in similar enterprises, though electrical supplies and pearl buttons form a part of its manufactures. Then, note the great difference in

* The review was prepared for the "American Gaslight Journal;" but a copy was sent by the author for publication in our columns.—ED. J.G.L.

Gas plants only.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
A—Total population	9,473	13,609	68,513	91,886	94,969	118,421	494,205
B—Consumers per mile of main	30·2	58·4	125·1	126·9	114·6	100·6	307
C—Cubic feet of gas sold per mile of main	695,705	1,168,668	3,104,724	2,815,185	3,006,799	2,910,212	2,528,360
D—Net price of gas sold per 1000 c. ft.	$1·55	$1·68	$1	$1·01	$0·90	$1	$1
E—Cubic feet of gas made per annum	8,375,000	13,131,200	241,096,900	368,962,000	406,461,000	327,531,000	1,200,163,000
F—Unaccounted-for gas, per cent.	6·65	7·29	5·62	11·25	8·29	4·37	6·76
G—Unaccounted-for gas per mile of main, c. ft.	50,549	93,381	187,341	358,692	274,731	133,449	184,660
H—Capital per mile of main, total, incl. works	$7,803·29	$7,706·19	$7,958·47	$6,521·12	$5,297·04	$6,519·39	$14,772·72
I—Total authorized capital stock	$60,000	$50,000	$575,000	$700,000	$650,000	$700,000	$6,500,000
J—Last dividend	None declared last year.	4 per cent.	10 per cent.	10 per cent.	13½ per cent.	10 per cent.	Aver. 7 p. ct.
K—Cubic feet capacity of works per day	100,000	150,000	1,400,000	3,000,000	3,000,000	2,000,000	14,000,000
L—Cubic feet of gas sold per consumer per an. (Average)	23,027	20,001	24,825	21,948	25,745	28,395	8235
M—Assessed value of Co.'s property	$20,800	$52,635	$575,000*	$1,201,000	$1,039,660	$853,500	$9,557,100
N—Average illuminating power of gas.	19·90	16·60	19·81	18·73	18·76	20·31	21·16

* Gas only.

consumers per mile of main, and consequent gas sales per unit. All the Massachusetts cities are largely of the same character—viz., the manufacturing population predominating. But when we find a city somewhat cosmopolitan, like No. 7, then, while the "consumers per mile of main" is greater, the number of cubic feet of gas sold per mile being a good fair average, it is much smaller per consumer, as will be noticed on line L, and yet the capital required per mile of main is *necessarily much greater*. In all the other examples given, the item runs along at about practically the same figure. When consumers are clamouring for reductions in the price of gas in cities both small and great, these facts might be well worth a little attention on the part of those most interested. Lines I and M taken together, indicate that the gas properties are safely and conservatively managed as to the financial part thereof; while line F would be to a practical gas man a like indication as to the technical part of the business.

What is here shown of seven cities or plants applies almost without exception to every one of the works named in this very interesting report. Certain it may be that "a new broom" might be able to introduce a few improvements here or there. That can be done after the best of managers, and is in nowise a reflection upon the ability of those so creditably at the helm, past or present. But would it not perhaps be well to occasionally call in for consultation a disinterested but competent outsider, who might thus enable the hard-working manager or superintendent to put into practice a few "new broom" advantages without at all giving the tried and reliable head of affairs any set-back whatever? Such a course does not imply superiority on the part of a consulting engineer; but he might be able to put some things into a new light—and who of us has not had an experience where such a thing has occurred to us?—and in that way far more than make up the comparatively trifling fee that must be charged. The writer, who has visited very many gas-works in his own country and abroad, never yet failed to learn something in every one of them; while at the same time, possibly, he could also have made a few improvements. A great deal of good in this direction is, no doubt, accomplished by the annual meetings of our Gas Associations; but it is not—it cannot be—expected that the results obtained on such pleasant occasions can be such as would be had from a personal visit of a competent gas engineer, who is disinterested in a sense, but also much more so in another—viz., that of giving a good return for the money paid him for such suggestions as he might be able to make.

The usefulness of the Massachusetts Gas Commissioners to all business men, investors, and the public can in no way be better understood than when their explanation of "Boston Gas Companies" is carefully read. They make this explanation, it would appear to the writer, as a sort of self-defence. The following extract will give some idea of the complexity of the Boston gas situation, as set forth by the Commissioners:—

> As stated in the report for 1899, after exhibiting at some length the relations of these companies, the facts about them show that they have the most intimate business relations; that they are to a large degree interdependent and managed in many respects as one property; that these complex and extraordinary relations offer great temptations to divert the earnings of the companies from their physical needs to the demands of *unauthorized securities* [italics are the author's]; afford abundant opportunity for confusing and concealing from the public their true relations and the facts about their actual profits; and that this confusion and concealment would be much more difficult, if not impossible, were they combined in form and in fact into a single responsible corporation, readily amenable to the general laws of the Commonwealth. In the opinion of the Board, the public interest will be best conserved by one company, whose capital shall bear a reasonable relation to the property actually employed in the business, with a single board of administrative officers and one set of books, in which all the operations of the company shall be correctly recorded.

So far the Gas and Electric Light Commissioners of the Commonwealth of Massachusetts. Perhaps the recommendations made by the Commissioners upon the subject may bear fruit, or possibly we may see another verification of an event towards which many of the world's financiers now seem pushing with all their might, and which may be briefly, and truly, expressed by this old, very old saying: "Whom the gods wish to destroy, they first make mad."

The laws of the State make very sensible provisions for the testing of gas. When testing for candle power, it is provided that only such a burner shall be used as is most suitable for the kind of gas to be tested. Companies manufacturing more than 15 million cubic feet of gas per annum must provide a disc photometer of a construction approved by the inspector; and the room where it is kept must be at his service on every working day from eight in the morning until six in the afternoon. The law provides that "if the gas of any company is found on three consecutive inspections to give less light than 16 standard English candles, or to contain more than 20 grains of sulphur or 10 grains of ammonia per 100 cubic feet, or any sulphuretted hydrogen, a fine of $100 shall be paid by such company to each city or town supplied by it." The report describes the method of testing for impurities, which is quite simple, though effective. There were 824 inspections made during the year covered by the report. There were 23 companies caught supplying gas deficient in candle power, but few of them more than once. There were 22 who had more sulphur than the law allows; 20 were caught sending out some sulphuretted hydrogen along with their gas; while in seven cases there was too much ammonia. But, as in the case of the candle power, few companies let it occur more than once. Evidently the inspectors camped right on the trail of offenders, for wherever deficiencies occurred more than once, the tests seem to have followed each other in close succession for awhile. Meters are tested and sealed by the State officers, and by so doing they no doubt satisfy both companies and consumers, since it relieves the former of unwarranted charges of fraud, and prevents unreasonable complaints. During the year ending Dec. 31, 1902, 42,688 meters were tested; the fees ranging from 25 c. each for 2 to 5 light meters, 30 c. each for 10 to 60 light meters, 50 c. each for 80 to 100 light meters, and then up to $2·50 for the sizes up to and including 500-light meters. The total sum received for fees on this account was $10,945·10; and of the entire number of meters tested, only 996 were so called "complaint" meters—the rest being either new or else recently repaired ones.

A chapter of the report is devoted to accidents from gas and electricity. There were 63 fatalities from gas, 16 of which were clear cases of suicide, and two resulted from ignorance of acetylene gas. Of 116 other cases which were not fatal, some were attempts at suicide, and the rest mostly caused by ignorance, in which the "fool-killer" so well known among gas men was prominently present. There were 14 fatal and 11 non-fatal accidents from electricity. None of these, unlike those resulting from gas, were "done on purpose." In this connection, it may be remarked that the philanthropists who have tried so hard to make the road of the occasional murderer easy to "the other side" might take the hint. Nobody seems to have tried suicide by the electric route; and it would no doubt be easier, besides giving the culprit a little time to repent, if, instead of the electric chair, the "gas-room" were to be substituted as the legal method of execution. Given a gas-tight room, furnished with a chair, table (upon which might be placed a copy of the Scriptures), and a gas-inlet under control of the proper officer, the horrible thing might be conducted at less expense, and possibly more decency on the whole, and more comfort to the condemned, than any of the other methods to kill legally afford.

In the report will be found an *unreliable* list of gas-stoves used in the State. The word italicized is used advisedly, because in the report the statement is made that, "although the figures are taken from the annual returns, they are in many cases necessarily estimates." The sizes of mains and meters used are given, besides many other details and manufacturing data, which it will pay students of the gas industry to go over and consider critically at their leisure.

In conclusion, let me say once more that it is hardly possible that any review whatever could do full justice to this very interesting and almost perfect treatise on the gas and electric lighting business, even though its facts are somewhat circumscribed by conditions not prevailing elsewhere than in New England. Though it comes in a modest paper cover, it is as valuable as a text-book, or as not a few other and more pretentious works. The earnest student will find much between its covers to interest, and, if he knows how to use the information given, to help him in his work. Much real good might be done by the establishment in other States of Commissions like that of Massachusetts.

TECHNICAL RECORD.

THE COMPARATIVE DURATION OF HORIZONTAL AND INCLINED RETORTS.

An exceedingly interesting return regarding the life of retorts has been made to the Edinburgh and Leith Gas Commissioners by Mr. W. R. Herring, the Engineer. The particulars have been compiled from the books of the Commissioners, recording the life and the work done by each individual setting during the whole time that the gas undertaking has been in the hands of the Commissioners. The statement proceeds: "The average life in days is arrived at by summing up the different periods during which each setting was in actual work. To obtain a fair average as to the work done by each retort, the Engineer ascertained the total lengths of retorts that had been purchased since the undertakings were acquired in August, 1888. This was divided into the total tons of coal carbonized during the same period, in order to arrive at the quantity carbonized during its life in the settings. No account is taken of the ordinary repairs, such as the cutting out of choked gas and air ports, the repair of the combustion chambers, and the renewal of parts of the retorts and settings. These are common, more or less, to all settings during the period of their normal life."

Comparative Statement Showing the Duration of Retorts and Settings at the Respective Works.

—	Edinburgh.	Leith.	Edinburgh (Inclines).	Granton.
Average duration. . .	354 days.	340 days.	782 days. (Still in working order.)	The Granton settings are built on exactly the same model as the New Street inclined settings; and there is nothing to show, after 180 days, that they will not be equally as satisfactory as those at New St., Edinburgh.
Retorts purchased since Commissioners acquired undertaking .	39,285 feet.	25,714 feet.	360 feet.	
Coal carbonized same period	Tons. 1,398,193	Tons. 696,938	Tons. 24,150	
Coal carbonized per foot of retort	35	27²	67	
Coal carbonized per retort	315	244	1,341	
Coal carbonized per 20-feet retort	700	542	1,341	

PROGRESS IN THE GAS INDUSTRY.

From an American Standpoint.

A recommendation made by the President of the Ohio Gaslight Association (Mr. Henry L. Doherty) at the annual meeting in 1902, and which was adopted, has already borne good fruit. It was to the effect that one of the members should be designated to prepare for presentation at the annual meeting this year a summary of the progress and improvements that have been made in the gas business during the past five years. Mr. Irvin Butterworth was chosen for the task, and how well he has discharged his duty was disclosed to the members when he submitted his report at their recent meeting in Cincinnati in March last. Necessarily the report, to keep it within reasonable and comprehensible limits, had to be confined to a superficial survey. The field is too great for anything more than this by a single individual. The *résumé*, there is no doubt, will prove a source of encouragement to any who feel that progress has been slow and invention indolent during the recent history of the gas business. It is easy to agree with Mr. Butterworth that there has been more or less advancement all along the line, touching almost every detail of the business, the aggregate effect of which has been to greatly increase the practical efficiency of the plants and methods of the industry. We will not limit ourselves to the order in which Mr. Butterworth has reported upon the five years' progress. He deals first with the advance made in gas-consuming appliances, then passes on to distribution, and finally he treats of the practical and mechanical features of gas manufacture. We prefer to reverse the order, and to the last section attention will first be turned. It is as follows:

Inclined Retorts.

Whatever may be said of the relative merits of inclines and horizontals, the use of the former has increased considerably during the past five years; and the construction of the system has been improved in some minor particulars. The retorts are made longer than formerly, which is said to be an advantage; the Germans now making them as long as 18 feet, and the English as long as 20 feet. The heats carried in inclined benches have been greatly increased; and their construction is, therefore, made stronger, with larger combustion chambers. The charging apparatus has been improved; measured charges by means of the "shot-pouch" system apparently being most in favour. A small hydraulic ram has been devised for moving the slide-valves on the coal-measuring chambers, and one has also been devised for discharging coke from retorts when necessary. In one American installation, the side walls are arranged to carry the weight of the upper and middle retorts, thus relieving the bottom retorts of this burden, and presumably lessening the troubles due to expansion. During approximately the past five years, more than 10,000 inclined retorts have been installed in England. In this country, inclined retorts are in operation at Louisville, Ky., and installations are being erected in New York City and Lynn, Mass. At least three foreign inclined-retort building companies are now represented in this country by well-known American gas-works construction firms; and two of our home companies are now prepared to build inclines after their own designs, while still another is making the same preparation. Just now, however, as is well known, gas engineers are disputing among themselves as to the relative economies of inclined retorts and horizontals operated by machinery.

Horizontal Retorts, Four Tiers High.

Benches of eight horizontal retorts placed four tiers high, have been used in England for several years, but have only within the past year been adopted in this country, where they have suddenly become very popular—many persons claiming the credit of their "discovery." This style of setting is now being installed in Milwaukee, Detroit, and Lowell; while the gas companies in many other cities, including Cincinnati, have decided to adopt them or are thinking of doing so. Obviously, benches of this construction must needs be operated by machinery. Their advantages are: (1) The same as those of the ordinary bench of sixes over the wide arch of a bench of nines. (2) A high and roomy combustion chamber. (3) The most easily heated of any form of bench. (4) Economy of ground space.

Bench Furnaces and Settings.

There has been little improvement in the construction of bench-furnaces. The rear clinkering bench, the use of which began in Germany and Great Britain many years ago, and which was introduced in this country about fifteen years since, is gradually becoming popular. In recuperator benches, the arches over the furnaces have been simplified, with blocks made larger and burned hard, with fewer clay joints, and larger ports for the exit of the gases into the combustion chambers. By careful selection and mixture of clays, American retorts and settings are now claimed to be as good as any in the world.

Charging and Drawing Machinery.

Considerable progress has been made in the introduction in this country of charging and drawing machinery, and in improving and perfecting the machines themselves. Machines are now going in at Milwaukee, Detroit, and other cities; and many of the smaller companies also are considering their adoption. In fact, the tendency just now seems to be towards horizontal retorts, especially in benches of eights, and machine charging and drawing rather than inclined retorts. The machines have recently been improved by lightening their reciprocating parts, improving the material entering into their construction, replacing chains with wire ropes, &c. One machine has been improved by the addition of an attachment to the charging-scoop which spreads out the coal as the scoop is withdrawn from the retort, contributing to better results when heavily charged. Another standard make of machine has been improved by increasing its capacity, and introducing an automatic damping device on the operating cylinder of the drawing machine, which makes it practically impossible to damage the seat of the retort, at the same time increasing the life of all the reciprocating parts, and doing away with the jar at the end of the stroke. There has also recently been put out a combined charging and drawing machine, which has a very promising future owing to its adaptability to the smaller sizes of retort-houses, where in the past machine charging and drawing has not been practicable, on account of the first cost of machines, and the necessity for using two or more men on the separate machines. With the combined machine, one man is expected to take care of twenty benches in a single line of fifteen to eighteen benches, where it is necessary to run the machine over a turntable and return on the opposite side of the house. The combined machine will cost about two-thirds as much as the same capacity in separate machines. Compressed air, steam, and hydraulic pressure are all used for operating the different makes of machines each having its advocates.

Coal and Coke Conveyors.

With the enlargement of gas-works and the increasing danger from labour troubles, machinery for handling coal and coke is coming more and more into demand for the larger works, and is being considerably improved. For handling coal in horizontal runs, the belt type of conveyor is in good favour; but for elevating coal and coke, as well as for moving them horizontally, gravity and self-filling grab and shovel buckets are being largely used. For conveying hot coke horizontally, belt or chain conveyors are in use, and are undergoing considerable improvements. Most of the chain conveyors for hot coke use a flat-bottomed trough, of either cast iron or plate, through which the coke is pulled by means of

cross-bars attached to one or two chains. The one-chain conveyor seems to be an improvement over the two-chain, for the reason that the two chains do not stretch equally from wear—one soon becoming longer than the other, resulting in trouble with the sprocket wheels, &c. In one recently improved conveyor of this sort, for conducting hot coke away from the retorts and quenching it, the coke is partially submerged in about 4 inches of water in the trough, and is pulled along so rapidly (about 100 feet per minute) that, according to the inventor, it does not have time to generate steam until it reaches the place provided for quenching it. The absence of steam is, however, probably due to the quick absorption of all the heat in the coke by the comparatively large volume of cold water into which it falls. Electricity is now being quite generally adopted as a motive power for driving coal and coke conveying machinery.

Self-Sealing Mouthpieces.

These are being gradually improved; one concern having recently added a detachable clamp and locking device, and providing a bushing in the lower part of the operating eccentric that will give equal wear in both top and bottom holes of the cotter-bar.

Hydraulic Mains.

There have been no noteworthy improvements in these. But the V-shaped mains are coming more into favour; and one concern has recently designed a V-shaped main, the bottom of each section of which slopes gradually from both ends towards the middle, facilitating the withdrawal of the heavy tar.

Exhausters.

There has been quite a number of minor improvements in exhausters, tending to make the impellers more perfect in their lines and work, and delivering a higher percentage of their theoretical displacement. These machines are now being made in a greater variety of sizes and designs than formerly; exhausters delivering as high as 500,000 cubic feet per hour, and 400 feet per revolution, now being in use. Vertical exhausters are now made with side inlet and discharge, and also horizontal with top and bottom inlet and discharge. Means have also been improved for keeping the exhausters in proper adjustment. An automatic regulating device for exhausters has recently been put into use that is said to be quite an improvement over the familiar Huntoon bucket. It is something like a natural gas-regulator, with a sheepskin diaphragm, which admits of a long range of movement of the valve without any variation of the resistance on the diaphragm. It is said to hold the pressure constant over a wide range of variation of steam pressure and exhauster speed.

Tar-Extractors.

Modern condensing systems provide for the removal of all tar before the gas reaches the washer-scrubbers, thus making the latter more efficient. The familiar Pelouze and Audouin tar-extractor, as used in this country, has recently been improved to conform to its construction in Germany. A tar and carbonic acid extractor has been introduced, as well as a new tar-extractor, in which the gas passes through a rain or drip chamber filled with liquid spray. One works has recently installed a centrifugal tar-extractor that gives the gas a whirling or spiral motion, throwing the tar globules out against the sides of the pipe, where they impinge and flow down the sides of the pipe. Another experimenter thinks he has found a centrifugal tar-extractor and exhauster combined—one apparatus serving both purposes.

Scrubbers and Washers.

The efficiency of tower scrubbers has been greatly increased by the use of an automatic flushing device, such as was described at the meeting of the Ohio Gaslight Association in 1901. A revolving brush washer-scrubber, originally brought out in England, is also finding great favour in this country. Systems of condensing, scrubbing, and washing have recently been so much improved that the oxide purifiers have much less work to do than formerly; and coals containing so much sulphur that they could not heretofore be economically used for gas manufacture can now be profitably employed for this purpose.

Purification.

Considerable progress has been made in purification processes and apparatus during the past five years. Probably the most important process improvement is the one in which, as the inventor expresses it, "the purified gas revives the foul oxide." As a matter of fact, of course, it is the slight percentage of air in the gas that does the work, and frequent emptying and refilling of the box avoided by periodically, or as often as necessary, reversing the flow of the gas, by which means the oxide in each half of the box is alternately fouled and revived—one half fouling while the other half is reviving, and *vice versâ*. No special design of box is essential for this process; but the round or "cheese-box" form is being generally used. The so-called "duplex box" is also coming into use, in which there are two beds of oxide, one above the other—the gas entering between them, and dividing into two streams, one stream passing upwards, and the other downwards. This secures a slower rate of flow for a given area of box. In fact, the present tendency of purifying-box construction is toward compactness. These "double deck" or duplex boxes are now being built as deep as 11 ft. 6 in., permitting two oxide beds, each 5 feet in depth.

Within the period under consideration, the novel form of purifying-box, described at the meeting of the Ohio Gaslight Association in 1898, has been successfully introduced in several cities; and one of the most radical departures of recent times from customary purification practice has been made in connection with these boxes by dispensing with the purifying-house itself. This has been done at Madison, Wis., where boxes of this construction have been successfully used out of doors throughout the past winter, the purifying-house being purposely omitted. The boxes are double, constituting virtually one box, 20 feet square and 13 ft. 6 in. deep, supported on columns 6 ft. 6 in. high; the space underneath being used for dumping the oxide. The boxes are lagged with pine sheeting, the total cost of which was only $250; and the space underneath them inclosed by wooden doors hung on weights so that they can be raised and lowered like ordinary windows. Steam-coils have been placed in this space for use, if necessary, in keeping the boxes warm; but on only one or two occasions during the past cold winter was the steam turned on as a precautionary measure; the temperature of the gas at the outlet of the boxes running generally 20° higher than at their inlet, without the use of steam. The successful operation of these boxes under the circumstances described seems to indicate that purifying-houses are wholly unnecessary. About four years ago, at Columbus, Ind., and more recently at New Orleans, there has been introduced a box of the ordinary shape but of very cheap construction, with cement bottom and sides, and employing dry-lute covers. Dry-lute covers are being used to a considerable extent in England; and experience with them indicates that they can be employed with advantage and economy.

There have been some recent improvements in purifier-trays, a new type having lately been patented by a member of the Ohio Gaslight Association. There is said to be a decided tendency at present toward the use of heavier trays. In the English practice, trays 2 inches deep are employed, with the slats thinner and closer together than in the ordinary trays.

Station Meters.

A noteworthy improvement has been made during the past five years in station meters by the invention of a three-compartment drum, which is said to increase the capacity of the ordinary station meter from 30 to 50 per cent. I have thus far been unable to obtain a detailed description of the device; but there is no question that it constitutes a desirable and important improvement. There seems to have been no progress made in the perfecting and developing of proportional meters, although at least one prominent gas engineer is now at work upon a new type, which he thinks will prove a solution of the problem.

Gasholders.

Probably the important development in gasholder construction during the past five years is the metal-to-metal riveting of the holder shells and crowns without any paint or mixture of any kind between the sheets. One concern has also made a new design of goose-necks that obviates the use of adjustments for the rollers; thus avoiding the danger of the latter being put out of proper adjustment by incompetent workmen or otherwise. Proposed cement holder tanks do not seem to be making much headway.

Valves.

An improved globe valve has recently come upon the market with renewable parts throughout, including the valve-seat, and which can be packed under pressure while wide open.

An Ohio company has recently been incorporated to manufacture a safety-valve for house service-pipes; its purpose being to automatically cut off the flow of gas entirely, if for any reason the pressure in the mains should be considerably decreased, or if the flow of gas should be temporarily interrupted.

There has been a great improvement in the ordinary large gate valves, and a decided improvement in the water-cooled valves for hot-blast work; one concern manufacturing several varieties of the latter, in some of which the body of the valve only is kept cooled, and in others both the body and the valve-seat, by streams of water passing through cases surrounding them. Another form permits the renewal of the seat of the valve when the old one wears out.

Various ingenious multiple purifier-valves have also recently been devised for directing and reversing the flow of gas in various ways through purifying-boxes. And in this connection it should be stated that the days of the old-fashioned centre-seal seem to be numbered; its place being taken by the improved valves which produce a more flexible means for handling the gas in accordance with the present advanced knowledge and practice in gas purification.

Stopcocks.

Stopcocks have been improved by making them of better metal, grinding them more perfectly, leaving larger gas-ways, and making them of a greater variety of weights for various purposes.

Photometry.

There has been much progress made in the development of the principles and practice of photometry during the past five

years; but before this art shall be perfected, it is not unlikely that gas men will have no further use for it, as they may by that time be determining the value of their product by means of the calorimeter rather than the photometer. The recent progress and present needs of photometry are well set forth in the following extract from a letter received last month from Professor C. P. Matthews, of Perdue University:—

We are still very far from the realization of a satisfactory primary standard of light, although distinct progress has been made in this direction during the past few years. The advent of several new light sources of the whiter hues has accentuated the difficulties heretofore experienced in photometry from colour difference. Existing standards are not of the same hue as these new illuminants. There is evident need of a new standard having a quality or colour that is a mean among the qualities possessed by sources of light in common use. As we are not likely for æsthetic reasons to tolerate sources that lie without the present range of colour, it would seem that the time is ripe for the development of such standard, if that be possible.

The candle and the carcel lamps are rapidly passing from use as light standards. In their place have risen the pentane standards, approved by the gas experts; and the Hefner amyl-acetate lamp, provisionally indorsed by the electrical fraternity.

The need of uniform secondary standards bearing the stamp of official approval is likely to be met by the National Bureau of Standards at Washington, which will soon be in a position to supply standardized incandescent lamps for photometric purposes. Such lamps are well adapted to the photometry of the incandescent lamp or the naked gas-flame. They are unsatisfactory for studies of mantle burners or the electric arc, owing to the colour differences alluded to above. The existence of a common source of secondary standards will do much to unify photometric measurements, and to lift them from the region of doubt and uncertainty in which they have so long resided.

Low Candle Power Gas.

As the result of the large use of incandescent burners, and the increasing use of gas for fuel purposes, a high candle-power gas is no longer essential. The demand for a low-priced gas that may be used yet more extensively for fuel has, in the last few years, brought about a decided change in our ideas as to candle power, the tendency now being to decrease the candle power and the cost while maintaining, so far as possible, the calorific value. In some large cities in Germany, as low as 10-candle gas is distributed. Quoting from a leading English gas journal of Dec. 28, 1901: "There appears now to be an overwhelming weight of technical opinion in favour of low candle-power gas, or at least in favour of a supply by each individual gas undertaking of that candle power which its position as regards coal supply renders the cheapest, irrespective of candle power, within limits—limits which some would put out at 14 candles, some at 12, and some as low as 10." The South Metropolitan Gas Company some time ago obtained parliamentary sanction for reducing the candle power of their gas from 16 to 14; and Parliament is now being petitioned by several other companies to allow them to distribute 13-candle gas. While these candle powers would be too low for this country at present, as the public mind has not been educated to accept them, yet the tendency undoubtedly is downward; and this may account, in part, for the present noticeable return to coal-gas works construction that is reported by the gas-works builders of this country.

Ammonia Concentrators.

Ammonia concentrators have been improved chiefly as to their durability; some types being now made, in all their parts, wholly of cast iron and lead.

Cyanide Extraction.

There has been considerable recent advancement in the extraction of cyanide compounds from illuminating gas, although progress in this direction seems to have been wholly confined to European countries. Those companies who have engaged in the business are said to have found it profitable. One company is said to be netting $40,000 per year out of a make of a 1000 million feet of gas, by the manufacture of yellow prussiate of potash. Cyanide compounds are now being successfully and profitably obtained from the spent oxide, from the ammoniacal liquor, and directly from the gas itself. One American gas chemist explains that the reason cyanide extraction is not being taken up by gas companies in this country at present is that a process is now being tried for making cyanide out of ammonia by the aid of metallic sodium manufactured electrolytically at Niagara Falls; and, as this process seems thus far to promise success, American gas companies are hesitating to invest any money in the business.

Water-Gas Apparatus and Processes.

There seems to have been no radical improvements made in water-gas apparatus during the past five years. One concern, has, however, brought out what they term a high carburettor design, in which the carburettor and superheater have been so extended as to crack up the oil at the lowest temperature possible; thereby retaining the heavy hydrocarbons. It also has a "wart" or "riser" connection between the generator and carburettor, which is said to practically prevent the carrying over of ashes and cinders to the carburetting brick. They have also introduced what they term a divided blast construction, which consists of hollow bearing-bars connected with a blast-box located in the lining. The bearing-bars have small openings opposite the spaces in the grate-bars, through which the air is uniformly distributed under the entire grate. An eastern concern has recently introduced what they call an "economizer;" its purpose being to utilize the heat that is generally blown up the chimney when blasting up the ordinary water-gas apparatus. They turn this hot blast through a shell containing a series of cast-iron tubes, through which the feed-water to the boiler passes, thereby utilizing, to excellent advantage (so it is claimed), this otherwise wasted heat. There are now two new oil-sprays on the market for spraying oil into the carburettor, both of which are said to be very effective and advantageous. One original and enthusiastic experimenter reports that he is now constructing a plant on a fairly large scale, by which he hopes to make water gas by a continuous process. In California, there is in quite extensive use a new process for making water gas wholly out of Californian crude oil without any solid fuel whatever; but I have been unable to obtain a description of the apparatus and its operation.

The Dellwik process of water-gas manufacture, introduced within the past five years, has for some reason been tried only experimentally in this country, not having been regularly adopted, so far as I know, in any plant. But in England, and more especially in Germany, the method is gaining headway, and promises much for economy in water-gas manufacture. Under this process, which increases the velocity of the air-blast when blowing up the generator fuel to incandescence, the carbonic acid does not have time to decompose to carbonic oxide; and thus a much greater proportion of heat than with the ordinary process is imparted to the fuel bed, where it is needed, instead of being sent forward to the carburettor or superheater where so much heat is not wanted; and thus a great waste of heat is prevented. The capacity of the apparatus is also thereby increased, which means a saving in cost of labour and in radiation of heat from the apparatus. A prominent American gas engineer writes me as follows: "The Dellwik process, to my mind, is a fundamental discovery in gas making. But it seems hardly fair to regard it merely as a discovery in gas making, for it will have even a greater influence upon fuel economics and other industries than in the gas business. The discovery of this process is certainly more important, in my opinion, than any other discovery since the invention of the Lowe machine."

Bye-Product Coke-Ovens.

An idea of the progress of bye-product coke-ovens in this country may be gathered from the statement that in 1901 only about 5·4 per cent. of the total metallurgical coke manufactured was made in bye-product coke-ovens; whereas it is estimated by the best authority that, with the ovens that have since been completed and that are now being built, the additional production will be such as to bring the amount to 13 per cent. of the total. Five years ago, gas companies looked upon bye-product coke-ovens as being simply an adjunct of the iron and steel business; but they are now beginning to adopt them for the manufacture of their own gas in those localities when there is a large use for coke. It is confidently predicted by one man engaged in the business that this process of making gas will, from now on, be rapidly adopted by many of the gas companies of this country. There are now two or three different bye-product coke-oven processes in operation in the United States; and many improvements have been made in them during the past five years. The size of the ovens themselves has been considerably increased, and fire-brick and settings for their construction are now being made in this country equal to those obtainable from abroad, and much cheaper. In one process the benzol is extracted from that portion of the gas which is evolved during the last half of the carbonization, and is used to enrich the gas evolving during the first half, which is intended for illuminating purposes. An under-fired principle has been adopted, by means of which the gas used for heating the ovens is burned practically with a bunsen flame. The foul-gas mains have been elevated to avoid the formation of pitch, and a new quenching car that is a great improvement over the old form has been put into use.

The growth of the bye-product process in this country since 1897 has been as follows: 1897, 280 completed ovens; 1898, 520; 1899, 1020; 1900, 1085; and 1901, 1165, producing 1,179,900 tons of coke. At the close of 1901, there were also 1533 ovens in course of erection; being considerably more than the total number then in use. There are now (March, 1903) 2232 of these coke-ovens in operation in this country, having a capacity for carbonizing about 13,400 tons of coal per day; and 1286 additional ovens are being erected at the present time.

Gas-Producers.

During the past five years, the following improvements have been made in gas-producers: (1) The mechanical handling of coal and ashes has been improved and more nearly perfected. (2) An automatic feeding and coal distributing device has been put into successful use. (3) An automatic, water-cooled, motor-driven stirrer has been devised and put into use, increasing the capacity of the producer about 20 per cent., conducing to a uniform quality of gas produced and decreasing labour. (4) The Mond gas-producing apparatus, saving the bye-products, has been improved and largely introduced, especially in Europe. Detroit also has a plant of this character. (5) An arrangement has been devised for operating the entire producer apparatus under a

partial vacuum; the air and steam being sucked through the fuel bed by the engine itself—thus doing away with the boiler and holder, the steam being produced by an open heater close to the producer. (6) Producers have been adapted to the manufacture of gas out of peat.

Odds and Ends from England.

English gas journals state that one experimenter, working upon an idea advanced by Professor Lewes, seems to have discovered a practical process for successfully converting coal tar into illuminating gas by means of a modified water-gas generator. Also, that a well-known engineer has devised a reversible condenser for the extraction of naphthalene from the gas that has successfully withstood a year's working test. Professor Lewes also seems to have hit upon a successful method of enriching water gas by passing it through coal-gas retorts during the process of carbonization. At Tipton, an admixture of about 30 per cent. of blue water gas with coal gas is being made in this manner; and the mixture is brought up to the candle power of the original coal gas by the use of only about one-third of a gallon of benzol per 1000 cubic feet of blue water gas.

Acetylene Lighting.

There has been much progress in acetylene lighting during the past five years. In fact, practically all of the progress it has thus far made has necessarily been accomplished during the period named, as it was only seven years ago that a cheap method was discovered for manufacturing calcium carbide. The annual production of calcium carbide in this country is now about 20,000 tons; in Europe, about 50,000 tons. Notwithstanding this increased production, its price has not been materially reduced; being now in quantity about $65 per ton. In 1898, there were but two small plants in this country for manufacturing acetylene and distributing it as an illuminant by means of pipes in the streets. Now there are 56 towns and villages lighted with it; the largest being Wabash, Ind., with a population of 8600. In Spain, a city of 14,300 is being lighted with it, besides many smaller towns. In 1901, it was lighting 47 towns in Germany, and 26 in France. Its use for portable and isolated lighting, such as carriages, railway coaches, country residences, and club houses has greatly increased; and the means for its manufacture and consumption have been greatly improved. It has been discovered that a mixture of one part of acetylene to three parts of Pintsch gas makes a much better illuminant for railway coaches than either of these gases alone; and this mixture is being largely adopted for car lighting in Germany and France. Acetylene for general distribution and use does not, however, seem to obtain a foothold where ordinary coal or water gas is obtainable.

Municipal Ownership of Gas-Works.

There seems to be no marked tendency towards municipal ownership of gas-works in this country; there having been but one such transfer in the last few years, and that the recent case of Holyoke, Mass. Taking into consideration the leasing by a private Company of the Philadelphia Gas-Works, there is much less gas now being made by municipalities in this country than there was a few years ago. In Great Britain and Ireland, the transfer from private to public ownership is proceeding so slowly as to be hardly noticeable; and the percentage of municipally owned gas-works is much smaller than the advocates of municipal ownership would have us believe, being only about 17 per cent. of the total.

REVIVIFICATION IN SITU, AND STOPPED ASCENSION-PIPES.

The following is a summary of some interesting observations on these matters, contained in a communication by Herr Burgemeister, the Manager of the Gas-Works at Celle, in Hanover, to a recent number of the "Journal für Gasbeleuchtung."

The object of this paper is to describe a simple and economical method of supplying air for the revivification of the fouled oxide in purifiers. It is simple, and can be easily introduced in a short time at any gas-works, and at little expense. It is economical, because it does not require steam or other motive power. The difference in the pressure of the gas as it issues from the scrubber, and as it passes into the atmospheric condenser, is utilized as the motive power. The outlet-pipe of the scrubber is tapped, and a cock is fitted. The gas pressure at this point is (say) 4 inches. A wrought-iron gas-pipe, 1½ inches in diameter, leads from the cock to a mixing-nozzle fixed immediately in front of the inlet-pipe of the first atmospheric condenser. Between the mixing-nozzle and the condenser there is another cock, which can be shut in the event of any stoppage of the exhauster. The mixing-nozzle is surrounded by a zinc casing, about 6 inches in diameter, extending downwards and connecting by a 2-inch pipe with the place where the air-meter is situated. The air-pipe is not, however, joined direct to the outlet of the meter, but runs on past the air-meter to a syphon; so that in the event of excessive pressure or a sudden stoppage of the exhauster, the condensation products—tar and gas liquor—are carried off.

The mixing-nozzle produces a vacuum of about 2-10ths. This vacuum does not quite suffice to set the air-meter in action, so the gas-exhauster is allowed to pull a negative pressure of 4-10ths. It is then quite possible, by means of a regulating cock at the inlet to the atmospheric condenser, to regulate the supply of air according to the gas production. A Wobbe 1½-inch mixing-nozzle exhausts 210 cubic feet of air per hour, which is sufficient for a daily production of 350,000 cubic feet of gas. For a larger make, more mixing-nozzles must be fitted; but they can all be fed from one 1½-inch pipe. The engineman who has charge of the gas-exhauster regulates the air supply precisely according to the gas production, and notes down the quantities of gas and air. Not more than 1½ per cent. of air is admitted, as it is well known that 2 per cent. and upwards of air considerably diminishes the heating as well as the lighting power of the gas. This method of admitting air has been in use at the gas-works at Celle since 1890, but does not appear to have attracted attention elsewhere.

If the air introduced has not to be measured, the matter is still simpler. As the mixing-nozzle gives a vacuum of 2-10ths, it is not necessary in this case to use the gas-exhauster. It is, however, essential to keep a sharper control on the purifiers, which must be frequently tested with lead paper for sulphuretted hydrogen. As soon as the air supply is too great, the purifiers begin to show clean. At gas-works where a vacuum of 2-10ths to 4-10ths is objected to, the air admission can be effected in the manner mentioned, without an air-meter. It can also be accomplished by inserting a dry gas-meter in the wrought-iron gas-pipe between the scrubber outlet and the mixing-nozzle. The volume of air exhausted by a mixing-nozzle of a certain diameter is known, and consequently the air can be drawn in and its amount calculated for the quantity of gas which has passed through. In this case, it will be advisable to fix several mixing-nozzles—say, three or four, or more—and provide each with two taps. Then one, two, or more mixing-nozzles, according to the production of gas, can be connected with a supply-pipe; and thus the pressure of the individual nozzles need not be weakened. Of course, the quantity of air can always be accurately fixed by moving the valves.

A wet gas-meter is recommended as an air-meter, for the following reasons: The air introduced generally carries with it particles of dust, which stick to the greased surfaces, and soon interfere with the action of a dry meter; the air also makes the membrane hard, and thus likewise stops the easy working of the meter. These troubles do not occur with a wet gas-meter. It is best to fill the meter with glycerine, as the dry air passing through absorbs a great deal of water, and renders frequent refilling necessary. An air-meter is, as stated, not absolutely necessary; but it is easier to manage and control the system if one is used.

If the oxide is left too long in the purifiers, it becomes so hard that it has to be hacked out. This hardening also renders it necessary to change the purifier, because the loose oxide put into the vessels gets its interstices blocked with sulphur, &c., which throws a higher pressure. As the oxide in the vessels becomes very dry, it is a question whether the purifiers could not be connected with a steam-pipe, and some steam be admitted from time to time to the stream of gas, to moisten the oxide. It would be worth trying, as in any case the formation of cyanide in the material would be improved, and the purifiers could be kept in action longer than at present. If the gas should become somewhat heated by the steam, it would have no effect on the deposition of naphthalene, which would have already become separated in the condensers.

The great saving effected by revivification in the vessels will be best seen from the fact that in the year 1889-90, 96 purifiers were changed; while last year, with nearly double the production of gas, only 14 were changed. It has been asserted that it is immaterial at what point the air is introduced; but in the author's opinion, the air should be added to the hot gas, and not to that which has already cooled. If the air mixes with the hot gas, it becomes enriched with the volatile tar oils or other gas-yielding substances present in the gas, which cannot occur with gas whic has already cooled. Three years ago, the air was introduced before the last scrubber, as it could be simply drawn in at this point by the exhauster; but it was found that the illuminating and heating power declined considerably, and had to be made up by the use, as an addition, of the best Bohemian brown coal. The air is now added to the warm gas, and proportionately much more can be admitted without any detriment to the lighting or heating power. It may be laid down as a rule that, to obtain the best effect, the air should only be added between the hydraulic main and the condenser.

Coming now to another point—viz., stoppages of the ascension-pipes in the retort-house, which may be reckoned as the most troublesome and disagreeable occurrences in a gas-works—a number of proposals have been made, none of which, however, have got rid of the difficulty. At the gas-works at Celle, the system of water admission was introduced fifteen years ago, after experiments had been made with iron pots filled with water in the retort mouthpiece. The latter method was very costly, and did not have the desired effect unless the water in the pots was filled up every two hours, which the workmen usually failed to do. It was therefore decided to replace these iron pots by a permanent water supply at the upper end of the ascension-pipe. The water should be supplied by drops only, so that it is completely evaporated in the pipe. The evaporation of the water loosens the particles of carbon which have already become

attached to the pipe, and they then run downwards. On the introduction of this method, the retort-lid must often be opened at first, and the greasy mass deposited in the lower portion of the pipes must be removed. After a time, the pipes will have become perfectly clean, and it will then only be necessary to clean the lower end of the pipe each time the retort is charged. By the evaporation of the water, heat is abstracted from the ascension-pipe; so that at the lower temperature a deposition of carbon cannot occur. This system was also introduced six or eight years ago at the Nienburg Gas-Works, and since then no stoppages have occurred there. It may be remarked that the system is not patented, any more than is the air-supply method previously mentioned. Its introduction is not attended with any great cost; and its good effect should lead to its adoption elsewhere.

GERMAN PROGRESS IN THE RECOVERY OF CYANOGEN.

(*Continued from p.* 156.)

In view of the criticisms of the procedure followed by Dr. Bueb for the extraction of cyanogen from coal gas, which have been made by the authorities already quoted in these articles, it is expedient at this stage to refer to a contribution in which Dr. Bueb answers those criticisms. Dr. J. Bueb is the well-known Chemist of the German Continental Gas Company; and his cyanogen recovery process has of recent years frequently been the subject of articles in the "JOURNAL."

Dr. Bueb first points out that cyanogen recovery has not the same economic significance for gas-works as for coke-oven works. For instance, the German Continental Gas Company work up to yellow prussiate at a special factory half the cyanogen recovered at their stations, yet the profit realized therefrom amounts to only 2 per cent. of the general net profit of the undertaking. Few German gas-works are so favourably disposed for cyanogen recovery; and in the majority of cases the profit therefrom would be less than 2 per cent. of their net profit. In most works where cyanogen is extracted, the extraction has been taken up not merely for the profit obtainable, but with a view to supplying gas of a higher degree of purity, and to avoiding the corrosion of gas-holder sheets and meter drums by the cyanogen in the gas. These indirect advantages of cyanogen extraction are often regarded as of greater importance than the direct ones, and, indeed, were primarily instrumental in determining the German Continental Gas Company to take up cyanogen recovery.

Dr. Bueb goes on to observe that it is a well-known fact that chemical products often fall in price very considerably while the quantity required goes on increasing, as has been the case with the rare earths used for the manufacture of mantles. Hence it is not surprising that the price of cyanogen compounds has fallen. It would further be interesting to learn what authority Herr Feld had for his statements as to the development of processes for the manufacture of potassium cyanide synthetically—partly from the nitrogen of the air. Dr. Bueb is not aware that appreciable quantities of cyanogen compounds made from atmospheric nitrogen are on the market. Herr Feld's figures as to the yield of cyanogen in gas manufacture, according to Dr. Bueb, also need some correction. For instance, the average proportion of cyanogen was stated to be equivalent to 4·5 oz. of prussian blue per 1000 cubic feet of gas. But the proportion of cyanogen in gas depends very largely upon the description of coal carbonized and the temperature of carbonization. Herr Feld's figures are correct for works where only English coal is used; but Westphalian, Upper Silesian, and Saar coals give a lower yield of cyanogen. The significance of this point is indicated by the following figures which Dr. Bueb gives for the annual outputs of three gas-works using different kinds of coal:—

Works.	Description of Coal Used.	Gas Made.	Prussian Blue in the Cyanogen Sludge.	
		Millions of Cubic Feet.	Total.	Per 1000 Cb. Ft. of Gas.
			Metric Tons.	Ounces.
Potsdam	English	205	25·8139	4·45
Warsaw	Upper Silesian	896	76·9530	2·87
Ruhrort	Westphalian	114	11·4457	3·55

These results considerably modify Herr Feld's estimate of 4·5 oz. of prussian blue per 1000 cubic feet of gas as an average yield. The extraction is complete at all these three works, as the gas at the outlet of the cyanogen washers is constantly tested to ascertain that it is free from cyanogen. Further Dr. Bueb states that Herr Feld is not justified in assuming that the theoretical yield of potassium cyanide can be practically obtained from the cyanogen in the gas. For instance, Herr Feld has stated that a gas-works carbonizing 50,000 tons of coal should produce 90 tons of potassium cyanide per annum. But if these figures are compared with those obtained in practice at (for example) Warsaw, a striking difference is at once observable. From Jan. 1 to Nov. 30, 1902, 89,487 metric tons of coal were carbonized at the Warsaw works, and 113½ metric tons of potassium ferrocyanide were produced. Now 125 tons of this salt are required for producing 100 tons of potassium cyanide; so that the corresponding quantity of the latter would be 90·8 tons. Thus, Warsaw practice indicates that 50,000 tons of coal yield only 50·734 tons of potassium cyanide, instead of the 90 tons given by Herr Feld as a fair yield.

Dr. Bueb goes on to demonstrate that Herr Feld has made incorrect assumptions in his comparison of the price obtainable for crude cyanogen compounds at the gas-works with the selling price of potassium cyanide. The greater part of the cost of conversion of ferrocyanide to cyanide lies in the value of the metallic sodium required; and this has been ignored by Herr Feld. The production of cyanide from ferrocyanide is being curtailed, owing to the development of processes for the direct production of potassium cyanide without the intervention of the ferrocyanide. Ferrocyanide as a raw material for the manufacture of potassium cyanide is being gradually superseded, because processes for the direct production of the cyanide from nitrogen compounds have now come to the forefront. It is futile to compare the price of potassium cyanide with that of a crude ferrocyanide in calculations of the probable returns from cyanogen recovery processes; the price of the commercial potassium or sodium ferrocyanide should, instead, form the basis of such calculations. The process patented by Herr Feld, for the production of hydrocyanic acid from compounds of iron and cyanogen—consisting in treating the neutral or acid material with mercuric chloride, and obtaining hydrocyanic acid by distilling the mercuric cyanide formed with acid—is, according to Dr. Bueb, costly and of no practical utility.

The conditions of cyanogen recovery at coke-ovens are even less favourable than at gas-works, because the proportion of cyanogen in the coke-oven gases is very much lower. Analyses made at a large number of coke-oven works have convinced Dr. Bueb that cyanogen extraction is not economically possible with the existing European ovens, because the depreciation and the interest charges on the apparatus required for cyanogen recovery would be too high in proportion to the small percentage of cyanogen in the gas.

It is further pointed out that Knublauch was not the first to describe the method for the absorption of cyanogen (or rather ammonium cyanide, as cyanogen itself scarcely occurs in crude coal gas) by the use of solutions of alkali and oxide of iron; for Dr. Leybold records the fact that E. Wilm described this process before it was patented by Knublauch. Dr. Leybold has shown also that the product from spent oxide, which is commonly described as prussian blue, is not of constant composition, but is a mixture of several varieties of compounds of iron and cyanogen, many of which also contain ammonia. Actually, the blue from spent oxide always contains some appreciable quantities of ammonia. Not one out of over a thousand samples of spent oxide examined was free from ammonia in a form in which it was insoluble in water. Practical experience teaches also that spent oxide, which has been thoroughly extracted with water, liberates considerable quantities of ammonia on treatment with alkalies or alkaline earths. The separation of an insoluble double compound of ammonium cyanide and the ferrocyanide, which takes place according to Dr. Bueb's process for the production of cyanogen sludge, and the general observation that spent oxide contains, in addition to iron and cyanogen, variable quantities of chemically combined ammonia, appear to justify the assumption that the presence of insoluble ammonia in spent oxide is essential to the existence therein of ferrocyanide. In spent oxide, however, the relation between the proportion of cyanogen and of insoluble ammonia is not a rigid or simple one, whereas this is the case with the product of Dr. Bueb's process.

Messrs. Kunheim and Co., who make these comments on the Bueb product, also state that the generalization that a high percentage of ammonia and a high percentage of sulphocyanide are always associated in spent oxide, does not apply to oxide which contains alkaline material in admixture. In such purifying material, much sulphocyanide often occurs, with very little ammonia; also some spent materials contain much ammonia and very little sulphocyanide. In these cases, the ammonia exists as sulphate, and it may perhaps be assumed that sulphate of iron, produced in revivification, takes up the ammonia required for the formation of polysulphide or sulphocyanide; so that no production of sulphocyanide can proceed.

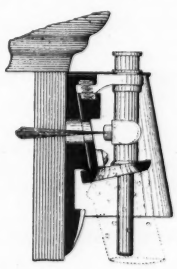
Dr. Bueb concludes his remarks on Herr Feld's communication by saying that, as the merits of the various processes must eventually be settled by their practical results, it is satisfactory to know that the City of Hamburg have decided to adopt the Feld process, in which the gas is treated, after it has traversed the ammonia washers, with milk of lime and a solution of ferrous sulphate, introduced in determined proportions, at a uniform rate, into the absorption apparatus. It will therefore be tried at one of the gas-works in Hamburg; and the results will be awaited with great interest. But against the contention of Herr Feld, that it is essential to remove the ammonia from gas as completely as possible before proceeding to extract the cyanogen, it may be pointed out that there are now 24 works, with an output of over 7000 million cubic feet of gas per annum, using the Bueb process,

in which nearly the whole of the cyanogen contained in the gas as it issues from the atmospheric condensers is recovered in the form of ferrocyanide. Only about 1 per cent. of the cyanogen in the Bueb sludge is in the form of sulphocyanide. Hence it is difficult to believe that a process in which the cyanogen extraction takes place after the water condensers and ammonia washers will give a higher yield of ferrocyanide.

(To be continued.)

THE MENIER LAMP-LIGHTER.

Those of our readers who have lately visited Brussels cannot fail to have been struck by the brilliancy with which the boulevards and principal streets of the city are illuminated by incandescent gas-burners. Though the Municipality have an extensive electricity supply station, and are necessarily desirous of utilizing to the greatest possible extent the current produced therein, they are not so dazzled by the electric light as to be oblivious of the advantages of the incandescent gas system; and the consequence has been that for some time past the Gas Committee have been engaged in the work of gradually replacing the ordinary gas-jets in the public lamps by Welsbach burners. A drive through the city one fine evening towards the close of last September revealed to a member of the "JOURNAL" staff the good progress which had then been made with the work; and according to the report of the Committee for the past year, which is noticed in another column, it has now been completed, and Brussels may be called an incandescent gas lighted city. It has for years been acknowledged to be "Paris in miniature;" and in many respects it is a good second to the gay city on the banks of the Seine. But in the matter of public lighting it runs it very closely. When deciding upon adopting the incandescent system, the Gas Committee were confronted, as others have been, with the



difficulty of lighting the burners; and eventually they adopted the plan devised by M. Menier, the Gas Inspector to the Corporation. The general arrangement and the details are shown in the accompanying illustrations. It will be seen that to the framework of the lantern is fixed an inverted metal cup or shield, within which is a tap furnished with a small injector, closed by a moveable cover. By means of a pipe attached below the large tap of the lantern, gas is conveyed to the tap of the lighter. On the lamp at the end of the lighting-torch being inserted in the cup, and pushed forward, the small tap is opened, the injector is ignited, and the resulting jet of flame is thrown horizontally above the burner chimney. As soon as the torch is removed, the tap closes automatically. The arrangement is quite simple, and it can be easily applied to existing lanterns. It obviates the necessity for introducing the lighting-torch into the lamp; and it allows of the burners being lighted, notwithstanding the prevalence of high winds, much more expeditiously than by the systems previously employed. At the present time there are some 6000 of these lighters in use in Brussels. The makers are the Compagnie Belge pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, Eau, et Électricité.

The Council of the Institution of Civil Engineers have made the following awards for papers read and discussed before the Institution during the past session: A Telford gold medal to Mr. Maurice Fitzmaurice, a Watt gold medal to Mr. Bertram Hopkinson, and a George Stephenson gold medal to Mr. Percy John Cowan. Telford premiums were given to Messrs. Charles Hopkinson, B.Sc., Ernest Talbot, Frederick Wilfrid Scott Stokes, Percy John Cowan, James Tayler Milton, and William James Larke. The presentation of these awards, together with those for papers which have not been subject to discussion (and will be announced later), will take place at the inaugural meeting of next session.

REGISTER OF PATENTS.

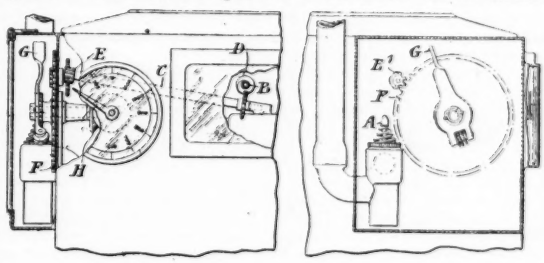
Prepayment Gas-Meters.—Metropolitan Gas-Meters, Limited, and J. D. Forster, of Peckham, S.E. No. 9411; April 23, 1902.

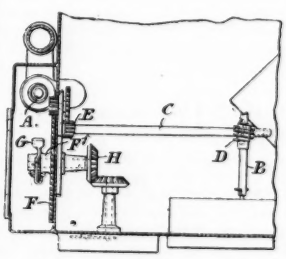
This invention relates to stop-meters—wherein mechanism for controlling the predetermined supply is usually in direct connection with the ordinary counting mechanism of the meter. The patentees propose to arrange mechanism independent of the ordinary counting mechanism of the meter; a separate dial being also advantageously provided for indicating the amount of gas which has been paid for by the purchaser.

The illustration shows a sectional front view, side view, and plan of the suggested arrangement of meter.

A is the gas inlet-valve, and B the usual index-spindle. C is the secondary spindle, mounted in a bearing in the attic of the meter, and driven from the index-spindle through the medium of the worm D and worm-wheel. The other end of the secondary spindle is provided with a pinion E, which drives, through gearing, the toothed wheel F, secured to a sleeve mounted upon a spindle which has keyed upon it the arm or tappet G for closing the inlet-valve. The arm has rotatably mounted on it a worm, which gears with the worm-wheel upon the sleeve; while the other end of the spindle has keyed upon it a bevel wheel H, which gears with a bevel-wheel upon a spindle which passes through the meter-casing, and is provided with a pointer which works over an enclosed dial to indicate the quantity of gas paid for and still unconsumed.

With this arrangement, the arm G is normally locked to the sleeve by the worm and worm-wheel, and is thus driven by the secondary spindle C from the index-spindle B of the meter. At the same time,





however, by turning the worm, the arm G can be set back (as shown) to the desired extent with relation to the toothed driving wheel F. The pointer also moves with the arm G, so that the inspector and the purchaser can see at a glance the quantity of gas which will be allowed to pass through the meter before the inlet-valve A is closed by the arm G.

In another arrangement, the secondary spindle is adapted to actuate (by means of a worm) a worm-wheel loosely mounted on a spindle carrying a pointer and the arm or tappet for actuating the inlet-valve to the meter. A clutch is also provided, by means of which the worm-wheel can be locked to, or disengaged from, the spindle—thus enabling the arm to be adjusted to the desired position for setting the apparatus.

In a further modification, the secondary spindle is caused to actuate (by means of a worm) a worm-wheel carrying a tappet or arm adapted to shut the gas inlet-valve. To enable the worm-wheel carrying the arm to be set, the secondary spindle is arranged so that it can slide axially with respect to the worm—thereby being disengaged from the actuating worm on the index-spindle. A button is provided upon the spindle to enable the inspector to effect this axial movement when he is setting the mechanism. This construction, it is said, possesses the advantage that the secondary spindle can be permanently disengaged from the index-spindle, whereupon the meter acts as an ordinary meter.

Manufacturing Metallically Skeletonized Earthy Incandescent Structures for Producing Light.—Langhans, R., of Berlin. No. 9412; April 23, 1902.

This invention relates to the manufacture of "structures which are composed of earthy oxides supported by an internal metallic skeleton, base, foundation, or core, and serve for the production of light by means of the incandescing action of heat."

The attempts hitherto made (says the patentee) to obtain skeletonized structures by covering fine platinum wire or a structure made with such wire with combustible fibres—as by spinning, by means of suitable agglutinants and the like—impregnating the fibre with a solution of salts, leaving behind refractory oxides when exposed to the action of heat, burning the fibre, and calcining, "have not resulted in serviceable products." The essential cause of the failure is that, on the one hand, but a rather small degree of adherence takes place between the smooth surface of the internal wire and the forming outer crust or layer of oxides, and, on the other hand, adherence does not exist at all points of the wire, whereas innumerous non-supported points alternate with well-supported and insufficiently supported ones. From this, it results that the oxides do not form, as they should do, a coheren or continuous crust, but a crust is produced which is interrupted by an immense number of irregularly distributed fissures and fine cracks, and consequently is not capable of withstanding the strains resulting from expansion and contraction, but is caused to detach in smaller and greater

portions. For this reason, such incandescent mantles, instead of being more durable, have proved to be even more decayable than skeleton-less mantles of ordinary description.

It is the object of the present invention to give long life to the skeletonized earthy incandescent structures or elements by enabling the elements to be so made that the crust of refractory oxides is well adherent to the skeleton and well coherent in itself. For this purpose, the invention consists in a process by which the necessity of using previously made fine wires is altogether dispensed with; the metallic skeleton and the oxide crust being produced simultaneously by one and the same process.

The patentee takes two sets of combustible threads (cotton, ramie, silk, and the like), and impregnates the threads of one set with a solution of salts, preferably of nitrates of the refractory oxides, desired to be used. These impregnated threads he calls "crust-threads." The threads of the other set are impregnated with a solution of such salts of platinum or metals of the platinum group as are capable of leaving behind a body of homogeneous metal when exposed to the action of a moderate heat—that is to say, which in the present instance leave behind their metal or metals in the shape of the thread. The impregnated threads of the second kind are called "skeleton-threads." Salts well adapted for making the "skeleton-threads" are the compounds which the metals of the platinum group or their halogen-salts form with the aliphatic sulphur derivatives cited in the United States patent No. 666,321—sulphur derivatives of the alcohol radicals (mercaptans, sulphides, alkyldisulphides, and so-called "sulphine compounds"), sulphur derivatives of the aldehydes (thioaldehydes, mercaptals), and sulphur derivatives of the ketones (thioketones, mercaptols)—particularly the nitrates of the so-called sulphine-salts. He, however, prefers to use nitrates of the oxides and protoxides of the metals which have proved to be reduced to metal by the heat of a bunsen burner without any sublimation of metal taking place, which is of high importance, as part of the metallic vapours would condense in and upon the oxide-crust forming, and thereby injure its light-emitting power.

After impregnation, the threads of both kinds are well dried, and one or more "skeleton-threads" and one or more "crust-threads" are formed into a compound thread, preferably by the spinning or twisting process, having care that the "skeleton-threads" are at all points well covered with "crust-threads." For making the compound thread, apparatus similar to that generally in use for spinning copper thread with silk for electrical purposes is used, so that compound threads are obtained in which the "crust-threads" are closely wound around a straightly extending "skeleton-thread." From the compound threads obtained, the desired structures are formed—for instance, mantles for use with bunsen burners; and the fibre is burnt, and the structure exposed to calcining heat whereby the platinum salts are reduced to metal and the covering earthy salts are transformed into oxide. The usual hose fabric is produced from the compound thread; the hose is cut into suitable lengths; the latter is made into the shape of the mantles; and the shaped pieces are burned and calcined.

Automatic Gas-Lighters.—Berthold, C. E. J., of Berlin. No. 9779; April 28, 1902.

These automatic gas-lighters consist of a pellet of catalytic material (such as will cause a jet of gas to be ignited when brought in contact therewith) contained in a casing so constructed that, by the motion of one part, the pellet is either exposed to the gas-jet or is entirely enclosed, which prevents the deterioration of the pellet by the atmosphere when not in use. The invention relates to means whereby the casing may be made to enclose or uncover the igniting pellet as required.

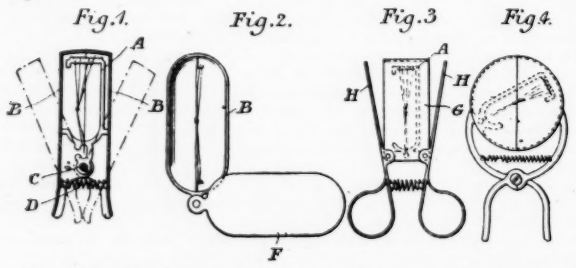
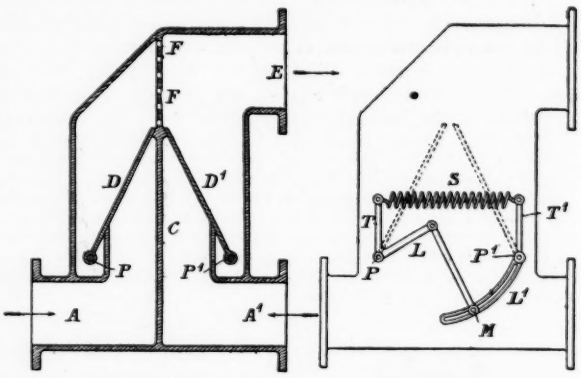


Fig. 1 shows one form of the lighter. The frame or holder A, with the catalytic material, has pivoted to it at C two hollow half casings B, which are by a suitable spring held in the closed position, so as to enclose the holder. They are provided with tail-pieces, by pressing which together the casings are turned into the open position shown in dotted lines, and thus expose the catalytic material. This construction can be modified by fixing the holder within one of the half casings, the second half being replaced by a hinged flat plate closing the opening of B, and either opened in the same way as in fig. 1, or turning sideways on a pivot as shown in fig. 2, where the catalytic material is held by platinum wire in the casing B, which is enclosed by the pivoted flat cover F. In a further modification, shown in fig. 3, the casing G is of a loop shape, open at the sides, which are closed by flat pivoted covers H, held together by a spring, and pressed open by their tails as shown. According to another modification (fig. 4), the two half-covers are fixed to ends of arms that are pivoted together like a pair of tongs, and acted upon by a spring tending to keep the half covers closed together, while on pressing on the tails of the arms, these (and with them the covers) are separated so as to expose the pellet.

Regulating the Quality of the Combustible Mixture in Internal Combustion Engines.—Lindemann, O.; a communication from Ernest Körting, of Hanover. No. 28,415; Dec. 23, 1902.

Assuming (says the patentee) that the proportions given to an internal combustion engine are most suitable for the use of a combustible mixture of a certain calorific value, it is desirable that this value should be maintained as constant as possible; and this object, it is claimed, is achieved by adding, when necessary, to the combustible gas another, it may be richer or poorer in calorific value (or even inert), in a proportion to keep the calorific value constant. The invention also relates to a device for admitting to the cylinder of a gas-engine such a mixture of two gases of different calorific values in constant proportion for all loads, and for altering the volume ratio of the two gases according to their quality, in order to obtain a mixture of the calorific value originally decided on for the engine in question. For this purpose, the two gases are drawn or pumped from separate supplies through separate valves, which are, however, so connected that any movement of one is accompanied by a proportionate movement of the other.

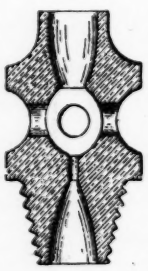


The illustration shows a valve-chamber enclosing such a pair of valves in section and in elevation.

The two gases are drawn by suction of the cylinder piston, or pumped from their respective supplies, through inlets A A^1, which are separated by a division wall C, and thence through the flap-valves D D^1 pivoted at P P^1 respectively. The division wall is continued beyond the valves to the other side of the chamber, and is perforated by a number of holes F, so that one of the gases passes into the other in a number of fine jets, and efficient mixing is thereby effected in the outlet passage E. The rods P P^1, on which the valves are pivoted, pass through the casing, and have rigidly attached to them two levers L L^1 linked by a connecting rod M, so that one valve cannot open without a corresponding opening of the other—the ratio of the two openings being determined by the ratio of the lengths of the levers L L^1. The latter ratio may be varied by providing a longitudinal slot in one of the levers, in which moves a pin at the end of the connecting link M provided with a clamping device. The valves are held on their seats by a spring S in tension between two arms T T^1 of the levers L L^1 respectively.

This construction fulfils the conditions required—viz., that for any given ratio of the lengths of the levers L L^1, the ratio of the openings of the valves D D^1, and therefore of the proportions of the gases drawn or pumped into the cylinder, is a constant; secondly, that this ratio can be varied within wide limits.

Acetylene Burners.—Bray, J. W., of Leeds. No. 11,131; May 15, 1902.



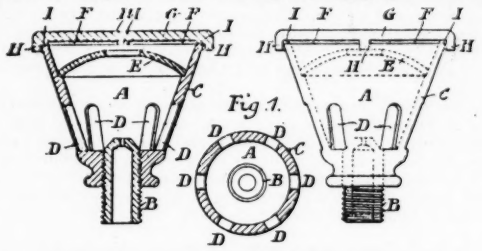
This invention in acetylene burners has for its object the prevention of the burning-back, and the consequent fouling of the burner thereby, when the gas issuing from the nipple is ignited. Hitherto the final aperture of the burner has been formed with parallel walls; but, as shown, the patentee proposes to form the final aperture of the burner of conical shape. Air-inlets are arranged at the apex of the conical discharge-mouth, and extend through the walls of the burner; and by constructing the burner in this way, the gas-flame is said to be less liable to light-back from the point of ignition to the small gas-jet aperture below, and the aperture is thus maintained in a cleaner state than hitherto.

Atmospheric Gas-Burners, Specially Applicable for Gas-Stoves.—Ellis, G. B.; a communication from Friedrich Siemens, of Dresden. No. 2193; Jan. 29, 1903.

A burner constructed according to this invention is, says the patentee, distinguished from atmospheric heating burners as hitherto commonly made, in which a mixing-pipe is usually employed, by the fact that the mixing-pipe is dispensed with; the mixture of the gas and air taking place in a vertical mixing-chamber provided in the burner itself. The chamber is covered in by a hood pierced with holes so that the mixture of air and gas formed is subjected to compression before it issues from the chamber—"complete combustion being thus obtained." The blue flame issues through slits (at the upper edge of the burner) extending around the burner, and being formed by placing a suitably shaped cover or plate thereon.

The gas is supplied to the mixing-chamber A by a pipe B screwed into the bottom of the burner or burner-head C. This latter is formed as an upwardly expanding conical casing; the wall being pierced with a number of openings D, whereby the air is admitted regularly at all sides to the mixing-chamber. This chamber is covered in by a domed hood E, provided with a central orifice; the hood serving "to produce great compression of the mixture of gas and air in the mixing-chamber." The combustible mixture passes out through the hole in the hood, and

issues from the slits F, where it burns. These slits extend around the upper edge of the burner-casing, and are formed by a cover-plate A placed over the top of the burner-casing, and engaging over the top edge



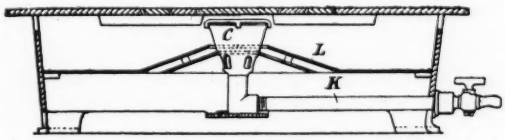


Fig. 2.

of it at four or more points H. The cover-plate is formed with projections I, whereby it is supported upon the upper edge of the burner-casing at a suitable distance from it, so as to form the slits.

Fig. 2 shows the application of the burner to a gas cooking-stove of a known construction, the gas being supplied by a pipe K. When such a stove is used with a covered flame, the burning gases from the atmospheric burner travel below the top plate of the stove, and heat it to a higher temperature, finally escaping through the orifices provided in the side walls of the stove close below the plate.

The employment of the burner in such a stove presents, it is said, the further advantage that very little waste of heat occurs, as the heat stored up chiefly by conduction and radiation in the body of the stove, and which would otherwise be lost, is utilized to effect a preliminary heating of the air supplied to the mixing-chamber—the air being caused to pass through a funnel-like casing L to the flame.

Pressure-Regulating Devices for Compressed Gas Apparatus.—Flohr, C., of Berlin. No. 4669; Feb. 27, 1903.

This invention refers to pressure-regulators of the kind described in patents No. 16,618 of 1899 and No. 910 of 1900—experience having shown that, in order to obtain the best possible results from the apparatus, it is advantageous to replace the single-acting pump referred to by a double-acting pump. The construction of the pressure-regulator itself must also be correspondingly altered, by replacing the means mentioned for locking and releasing the suction valve cone by an arrangement better adapted to the increased capacity of the apparatus. Though the variations of pressure which occur with the apparatus described in the prior specifications are said to be very small, even these slight fluctuations are obviated by means of the present invention—"substituting for the suction valve cone connected with the float arranged in the gas-collector, one or more rotary distributing valves connected with the float, and arranged in a conduit placing the two sides of the cylinder in communication—the valve or valves being opened by a predetermined gas pressure."

APPLICATIONS FOR LETTERS PATENT.

8866.—SCHILL, C. H., and LANE, H., "Gas-burners." April 20.
8872.—MEININGHAUS, E., "Gas heating-stoves." April 20.
8879.—BROWN, F., CLOWES, R., and MOSS, R. J., "Acetylene gas-generators." April 20.
8891.—HARGREAVES, J., "Valves for gas and water." April 20.
8923.—FRANCIS, G. B., "Illuminating apparatus." April 20.
8953.—THUBRON, D., "Acetylene gas-generators." April 21.
9143.—HUBERT, C., "Incandescent gas-burners." April 22.
9155.—GRIFFIN, W. T., "Making fuel and other gas, and burning same." April 23.
9156.—GRIFFIN, W. T., "Coking carbonaceous material." April 23.
9169.—EVERITT, W., and REDMAN, T., "Extraction of tar and other impurities from illuminating gas." April 23.
9172.—ELLISON, H., "Manufacturing tar macadam." April 23.
9217.—MARTIN, F. S., "Gas-cocks." April 23.
9244.—PICKERING, W. S., "Valves for gas purifiers." April 23.
9285.—EHMANN, C. P., and MORTON, F., "Atmospheric gas-burners." April 24.
9297.—CAPITAINE, E., "Portable gas-engines." April 24.
9319.—GRAETZ, M., "Incandescent gas-burner." April 24.
9396.—GUTKNECHT, H., "Utilization of substances obtained in the purification of coal gas." April 25.

Quality of the Metropolis Water Supply.—In their report on the London water supply for last month, Sir William Crookes and Professor Dewar say that, without a largely increased staff and expenditure, it would be impossible to examine a greater number of samples than 700 or 800 a month, which up to the present they have regarded as sufficient to check the daily working of the various Companies. During the whole period of their conduct of the chemistry and bacteriology of the water supply of the Metropolis (now extending over 23 years), they have always acted as a perfectly independent authority; and no interest has been more paramount with them than that of the water consumers. Their duty has been to endeavour to make the Water Companies work up to the highest efficiency; and they are confident that the general condition of the supply was never more carefully superintended and more satisfactory.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Blue Gas at Cleethorpes, &c.

SIR,—Being laid off from business lately, I have been working out a rough calculation, which might perhaps be of some little interest, and encourage Mr. Glasgow to come down to figures a little also.

The following consists of an effort to get an idea of the values of the plants about which there has been lately some little controversy; and as I have had to depend on memory for many of the figures, I hope there may be nothing of consequence requiring correction when I once more can get at the files of the "JOURNAL."

Lowe System.—From a large number of workings of this system which have appeared in the columns of the "JOURNAL" during the past few years, average good practice seems to be about 36 lbs. of coke in the generator and 10 lbs. for the boiler—making a total of some 46 lbs. of coke per 1000 cubic feet of carburetted water gas, and from 7 to 7·5 candles per gallon for oil. An average of 2·76 gallons for 21 candles, or 7·25 candles, will be taken, which is admittedly good practice. If we assume for the sake of the argument 85 cubic feet of oil gas per gallon, and the oil of ·865 specific gravity, we get something like the following:—

Carburetted Water Gas, 21 Candles.

Oil gas from 2·76 gallons at 85 cubic feet = 234·6 cubic feet.
Blue ,, 46 lbs. of coke by difference = 765·4 1000 cubic feet.
Or at the rate of (say) 37,300 cubic feet of blue gas per ton of coke.

Efficiency.

	B.T.U.	B.T.U.
46·00 lbs. of coke at	13,400 =	616,400
23·87 ,, ,, ,,	20,000 =	477,400
	B.T.U.	1,093,800

Yield = 1000 cubic feet of 21-candle carburetted water gas at 530 cubic feet = 530·000 } 49 per cent.

Dellwik and Young.—In the particulars of this combination as given in the "JOURNAL" for March 24, no mention is directly made of the quantity of boiler fuel required, either in the case of the Tipton or the Cleethorpes (Dellwik) plant. In the Tipton gas costs, is shown 0·39d. per 1000 cubic feet for boiler fuel, with coke at 11s. a ton, which is equal to 6·6 lbs.; also the coke for the generator at Tipton is shown as 2·20d., which at 11s. per ton comes out as 37·3 lbs. per 1000, or 60,000 cubic feet per ton of coke. If the 5694 gallons of oil used during the test at Cleethorpes are taken as yielding about 85 cubic feet per gallon, then the 37 tons 14 cwt. of coke used for the generator figures out as 39·9 lbs. per 1000 cubic feet of blue gas, or 56,100 cubic feet per ton.

The extra coke (beyond the oil coke produced and burnt) required for heating the oil-retorts figures out at 1004 lbs. per ton of oil carbonized, or 3·95 lbs. per gallon. The oil used at Cleethorpes was 2 19 gallons per 1000 cubic feet of carburetted water gas for 17·73 candles or 8·1 candles per gallon. So for 21 candles (to compare with the "Lowe" system) say 2·59 gallons would be needed. Then—

Coke for Dellwik generator	= 37·3 lbs.	} = 51,000 cubic fe of blue gas per ton of o e.
,, ,, boiler ,,	= 6·6	
	43·9	
Extra fuel for oil-retorts 2·59 gallons of oil at 3·95 lbs. coke.	= 10·3	
	54·2	

Efficiency.

	B.T.U.	B.T.U.
54·2 lbs. of coke at	13,400 =	726,280
2·59 gallons of oil × 8·65 = 22·4 lbs. at	20,000 =	448,000
	B T.U.	1,174,280

Yield = 1000 cubic feet of 21-candle carburetted water gas at 530 = 530,000 } 45 per cent.

From these figures, then—as far as they go—the Lowe system shows a better performance; and as I understand the first cost is the same for both plants, then either a lower running cost or a higher calorific value for the gas must be rendered by the combination process to balance matters up.

It would appear that the increased value obtained from the oil by the combination process is lost in the extra coke consumed.

Perhaps Tipton and Cleethorpes will let us know the definite quantity of boiler fuel and the calorific values of the coke used, as well as that of the finished gas, &c., &c.

I have tried to give both systems fair play, and shall be glad of correction—remembering always that much has had to be assumed for the sake of the working.

W. UPTON [sometime "CALIFACCION."]

1, *East India Avenue, E.C., April* 27, 1903.

SIR,—With reference to the particulars of Mr. Brockway's experience with the combined blue gas plant and the Peebles process, appearing in your issue of the 28th ult., there are a few points other than those touched upon in the editorial comment which would be all the better for a little more elucidation.

Peebles Process.—Would Mr. Brockway kindly give the yield of oil gas per ton of oil used by this process, and also the calorific value of same, as the corresponding particulars have been so given for the coal-gas plant?

Purifying.—Surely the value of the materials used should have been included, as well as labour. As the cost is so extremely low, might I ask to what extent purification is carried out? Is the sulphuretted hydrogen, for instance, *entirely* removed?

Blue Gas Yield.—This is averaged at 69,000 cubic feet per ton of coke

but no mention is made in the paper as to whether this was purified from carbonic acid or not. It would appear, however, from the discussion that it is not. Therefore this yield is unpurified. It is as well to be exact on the point; also the calorific value of the gas is absolutely essential to form an opinion of the value obtained from its different applications as touched upon in the paper.

Cost of Blue Gas.—It would have been of great value if the weights of the coke and breeze used were given as well as the values, so that comparison might be possible under market conditions other than those ruling at Cleethorpes.

Cost of Carburetted Water Gas.—I would suggest that the coke and breeze used for the oil gas be shown separate from that required for the water gas, so that the cost of gas other than the 16½ candles shown, could be arrived at.

In conclusion, I think it would be well to remember that this combination is at present having the advantage of the personal attendance of the chief, and that when it comes to be thrown on the care of others, such excellent candle values might not be looked for. Speaking of this reminds me that as the carbonic acid is evidently not removed, the actual candles per gallon might be another 1 to 1½ candles higher than that given; and I believe the similar values taken usually for the Lowe system are *after* purification.

A little more information on this point also would be valuable.

W. UPTON.

1, *East India Avenue, E.C., May* 1, 1903.

Mr. Brockway's Paper on Blue Water Gas, and the Enrichment by the Peebles Oil-Gas Process.

SIR,—In your editorial comments upon the discussion evoked by Mr. Brockway's paper upon "Blue Water Gas and its Enrichment by the Peebles Oil-Gas Process," you suggest that the interest attaching to my criticism would be enhanced by the publication of information upon several points you enumerate.

I stated that the cost of 18-candle carburetted water gas at Lincoln is 10d. per 1000 cubic feet. This amount is made up as follows:—

Oil, 2·33 gallons at 2 1/16d.	6·27d.
Coke, 37·6 lbs. at 10s. per ton	2·01
Boiler fuel, 5·1 lbs. at 10s. per ton	0·27
Labour	1·00
Purifying, lime and labour, *less* spent lime sold	0·64
Water, oil, &c.	0·20
Repairs and maintenance	0·20
Management	0·15
	10·74d.
Less value of residual tar (estimated at 10 per cent. of oil used)	0·46
Cost of carburetted water gas per 1000 cubic feet	10·28d.

Average illuminating power, 18·18 candles.

The foregoing figures represent the actual cost for the three months ending March 31 last, except in the matter of wear and tear. The amount charged to this account is slightly in excess of the total expenditure incurred per 1000 cubic feet of gas made, since the plant was started two-and-a-half years ago.

The nominal daily capacity of the plant is 500,000 cubic feet. During the period covered by the above statement, the plant was working an average of about seven hours per day.

I wish to point out that I do not claim that my results are at all exceptional. I have no doubt that many of my friends equal, if they do not surpass, them.

When you ask me to say how my working compares with that of Ilford and Tipton, it appears to me that you invite a comparison between systems essentially diverse. I am not in a position to supply figures corresponding to those which represent the cost of *blue water gas* when the manufacture of that particular gas forms in itself a distinct process.

For the present, I am quite content and satisfied to confine my attention to the processes for which the Lowe plant is designed, and so successfully effects.

JNO. CARTER.

Lincoln, May 2, 1903.

Messrs. Humphreys and Glasgow and Dr. Kramers' Water-Gas Apparatus.

SIR,—Our attention has been directed to the opinion on Dr. Kramers' water-gas apparatus given by Messrs. Humphreys and Glasgow in the "JOURNAL" for Jan. 20, when was published the translation of a letter which appeared in "Het Gas" last May. As this letter was but one of a series that appeared last year in the Dutch journal, and containing a discussion between Dr. Kramers, Mr. Sissingh, Dr. Smits, Messrs. Humphreys and Glasgow, and the undersigned, it would be necessary to publish the complete correspondence before the readers of your "JOURNAL" can understand a criticism thereon. We may however say that the letter of Messrs. Humphreys and Glasgow was amply answered by Dr. Kramers and the undersigned in "Het Gas" for Jan., 1902. The following were the conclusions arrived at.

1. It is not necessary to supply coal gas with water gas expensively carburetted with oil gases in order to obtain a calorific effect of 5000 calories. The same effect can be practically reached by means of blue water gas cheaply carburetted with benzol, as for instance at Königsberg, where 20 per cent. of the blue water gas is mixed with the coal gas and carburetted with benzol—bringing the heating power of the mixture up to 5067 calories.

2. Everybody knows well that the flame temperature of blue water gas is higher than that of coal gas or richly carburetted water gas. This assertion can be tested in a very easy way, by holding a thread of platinum 1 mm. thick in the different flames. It will seem that only in the flame of blue water-gas is the platinum melted. The incandescent effect of different gases is not a question of calorific power, but of flame temperature; and therefore blue water gas is the best gas in the matter of incandescence.

3. It is a mistake of Messrs. Humphreys and Glasgow that, in their apparatus, a large portion of the coke in the generator is devoted to the manufacture of oil gas. The temperature in the fixing chambers is maintained by partly burning the carbon deposed from the oil during the last blasting period, as Mr. Sissingh himself has pointed out as a result of using the Humphreys and Glasgow water-gas apparatus at Rotterdam.

4. As the report by the Dutch Committee makes no mention of any attempt to examine and neutralize the conditions of the fires at the start and finish, Messrs. Humphreys and Glasgow *supposed* that the attempts are not made. Such attempts, however, are the first requirements for the making of a chemical-technical experiment; and seeing that the report was signed by Professor Bakhuis Roozeboom, of the University of Amsterdam, and Mr. J. Blom, Sen., Director of the Gas-Works at Harlem and President of the "Vereeniging van Gasfabrikanters in Nederland," this remark will remain unanswered.

5. A yield per kilo. of carbon consumed in generators of 3·28 cubic metres of gas with the heating values of 2871 C. V. and 2626 N. V. means only an efficiency of over 100 per cent. by forgetting that the gas was made out of coal containing besides carbon (as usual) hydrogen also, and that for making steam fuel has always to be used. The heating powers of this hydrogen and fuel are also collected in the gas. Indeed, a little thermo-chemical mathematics is indispensable for making a proper calorific balance.

6. Noting that Dr. Kramers endeavours to meet Mr. Sissingh's criticism by reverting to a yield of 2·74 cubic metres per kilo. of bituminous coal, Messrs. Humphreys and Glasgow will do well to note also that 3·28 cubic metres per kilo. of *carbon* and 2·74 cubic metres per kilo. of *bituminous coal* is the same—being the alloy of carbon of the bituminous coal 83·5 per cent. (see the report of the Commission).

Qualifying the tests with the Kramers' apparatus as "laboratory experiments" is as strange as it is ridiculous; seeing that the apparatus has a capacity of 150 cubic metres per hour. But as Messrs. Humphreys and Glasgow "make no attempt to analyze our discussions," they also evidently take no trouble to study our publications; and it is therefore impossible to dispute further with them.

For THE WATER-GAS COMPANY
SYSTEM DR. KRAMERS AND AARTS.
DR. ALPH STEGER.

Amsterdam, April 25, 1903.

The Sale of the Vivid Mantle in Australia.

SIR,—I beg leave to correct an absolutely erroneous statement which occurs in this week's issue of the "JOURNAL," in connection with the action this Company has pending against the Vivid Company in Australia.

In your pages you state on the authority of the Vivid Company that "an injunction against the sale of the Vivid mantle has been refused in Australia." This is absolutely incorrect. The fact of the matter is, as you are aware, and as you recently published in your valuable columns, that the Vivid Company's Australian representatives attempted to commit this Company's representatives in Sydney for Contempt of Court, owing to certain advertisements issued by this Company. The Vivid Company lost their case, as you are, of course, aware, having to pay costs for both sides.

The actual infringement action has, up to my latest advices, not yet come on for hearing; and I therefore trust that, in justice to ourselves and the public, you will be kind enough to correct the misleading statement above referred to.

WELSBACH LIGHT COMPANY OF AUSTRALASIA, LIMITED.
W. KING, Secretary.

London, May 1, 1903.

[The above letter has been submitted to the gentleman from whom the information as published last week was obtained. His reply is a pithy one. It is: "The Judge has neither granted an injunction, nor appointed a receiver. The 'Vivid' is selling."—ED. J. G. L.]

Calorimetry.

SIR,—I have read with much interest Mr. Fearon's paper on "Calorimetry," reported in your issue of April 28. I am pleased to see that he is able, from experiments, to speak so well of the Simmance-Abady calorimeter, and that he notes in passing that it embodies one, at least, of the four requisites of the ideal calorimeter.

With regard to the other three points, the practice of having an overhead tank is one which is always recommended by me and is being adopted generally. The second point—namely, the question of draughts in the room—is also one on which we always lay stress, although I fear that advice in this direction (even in photometer rooms) is more or less disregarded. Referring to the automatic switch, this is a matter which Mr. Simmance, in his small book entitled "The Calorimetry of Coal Gas," has discussed to a considerable extent. There are absolutely no difficulties in this, except one, and that is the expense. Perhaps you will permit me to make it known to those of your readers who are interested in calorimetry, that if they desire to have an automatic switch arrangement fitted to a calorimeter, there is no difficulty whatever in the way, except that it entails a rather expensive addition to the usual equipment.

There is another interesting alternative method of taking continuous records of calorific power, which we are at the present time designing for a power-gas consumer—namely, a constant and pre-arranged flow of water; a constant and pre-arranged flow of gas; and apparatus for registering the difference between the inlet and outlet thermometers of the calorimeter. It will be seen that the difference in the thermometers under these circumstances bears a definite ratio to the calorific power, and gives a record sufficiently accurate for all technical purposes. The only error there is (given careful adjustment) is if the gas varies materially in specific gravity.

JACQUES ABADY.

Earl Street, S.W., April 29, 1903.

The Use of Engines with Power-Gas Plants.

SIR,—Surely the paragraphs in your issue of April 21 on this subject were written by someone not quite up-to-date in what is everyday knowledge of the capabilities of modern gas plants. After quoting the remarks of the Chairman of the Westinghouse Company at their annual meeting some months ago, and which have been already commented upon and certain of the statements contradicted in the Press, the writer makes assertions which would imply that no bituminous coal-gas plants were at work in connection with gas-engines. Such plants do exist, and have been in operation for years, which proves that the possibility of supplying clean gas is an accomplished fact.

At Messrs. Brunner, Mond, and Co.'s works at Northwich, a Crossley gas-engine of 400-horse power worked 98 per cent. of the total number of hours of last year, which shows that not much trouble could have arisen from impure gas, nor that any serious amount of dust or tar could have been left in it. We also have four engines of 500-horse power working night and day at a large works in the Midlands with the same gas; and we trust to a bituminous coal-gas plant to drive the engines which earn our daily bread.

The Wilson, Mond, Mason, and Crossley gas-plants all make clean gas from bituminous coal—which, if not absolutely free from tar and dust, is quite sufficiently so for all practical purposes—and are all in everyday and successful operation.

Manchester, April 27, 1903.

CROSSLEY BROS., LTD.,
per D. H. Irwin, Director.

[The observations referred to by Mr. Irwin were a challenge to Mr. Westinghouse to produce evidence of the success of his particular gas-cleaning device, and do not bear the interpretation suggested by Mr. Irwin, of ignoring what others can do in the way of cleaning bituminous coal producer-gas by methods and plant of a nature familiar enough to everybody acquainted with gas manufacture. Of course, where this can be conveniently done, any make of bituminous fuel gas can be condensed, and washed, and purified in the ordinary way. But we believe that Mr. Westinghouse has been looking for a perfect power and fuel gas for many years, and are naturally curious to learn something about it—especially in regard to the point raised; because if there is a way of cleansing coal gas which costs less, and occupies less room, than ordinary gas purifying plant, our readers would like to know of it.—ED. J.G.L.]

The Price of Gas for Power Purposes.

SIR,—It is interesting to find Sir George Livesey bringing forward for discussion the question of a reduced price for gas for power purposes; for it is one that is now more than ever concerning the minds of those who have to shape the policy of gas undertakings, and one upon which not a few people find it difficult to form an opinion supportable by argument from the points of view both of policy and economy.

It is all very well for anyone to point to the practice of electricity suppliers—which would be very different if storage were as easy for them as it is in the case of gas—and to advocate making a heavy "cut" in the price of gas to meet the competition of electricity, oil engines, or power gas; telling you airily at the same time to wait and "see what happens." But something a little more considered than such a "cut in the dark" would commend itself to most business men who have got beyond the idea of the old lady who sold her goods at less than cost, but was sufficiently rewarded by contemplating the extent of her business.

Selling goods at a loss to oust or keep out a competitor who can profitably sell his commodity at a price that does not allow you to undersell him at a "living" price for yours, is a policy which can only be expedient in extreme cases, and one which could never be adopted permanently. What gas managers are concerned to know, therefore, is whether there are good grounds for selling gas for power at a less price than that charged for the same quality gas used for other purposes; and, if such good grounds exist, to what extent the price for power can be reduced without doing injustice to other users of gas. Sir George Livesey's letter renders it necessary for the advocates of cheap gas for power to make quite sure of the ground they stand on.

It is argued that power gas is day gas. It is not by any means always so. Gas-engines for printing works come on to the night load as well as the day, while gas power for generating electric light is coming steadily into vogue, and the consumption for such purposes is obviously not improving the day load. But, granted that a large proportion of power gas is used during daylight, has not the user of gas for cooking and heating purposes also a claim for preferential treatment if use by day is a ground for such a claim? Does not, however, the daylight user, as such, derive as much benefit as he is fairly entitled to from the all-round reduction in the price of gas which results from an improvement in the load factor? Supposing gas had been first used for "daylight" purposes mainly, then when its lighting value was discovered users for lighting purposes might have put forward a claim for lower rates. Is it fair to give preference to the last comer, because he fills in the gap? It seems to me the only answer can be, "No, unless you can only get his custom by granting special terms." The day-load argument, by itself, is not strong enough.

To justify the granting of preferential terms to power consumers, it must be shown that the offering of such terms would be the means either of retaining present consumers who would otherwise be captured by competitors, or of so greatly increasing the use of gas as to make good out of the additional profit earned (after charging against the additional revenue all the costs, including interest on capital, fairly to be charged against the increased output) the loss of profit sustained in granting the revised terms to the already existing power consumers, and so ensure that the lighting consumer at least would not suffer by the cheapening of gas for power. If, further, the increase to the output and especially to the daylight consumption were so great as to render it possible to reduce subsequently the price of gas for other purposes, then a policy of cheap power gas would be doubly justified.

Now, it is my firm belief that such a justification for a cheap power gas policy would be afforded by the event; and if my letter up to this point has been written as if the wisdom of such a policy were doubtful, it has only been because it is necessary that every advocate of such a policy should consider carefully all that can be urged against it, should not try to support it by unsound argument, nor carry it to a point which would involve injustice to other users of gas—in other words, should, as Sir George Livesey says, base his policy on reason and sound estimates, and not merely go "blind" on it.

The practical question to be answered consequently is, "To what extent can the price of gas for power be reduced without doing injustice to other consumers?" That is, however, obviously a question that can only be decided in each individual case after a careful consideration of all local circumstances, existing and likely to arise. But may it not be suggested that, in seeking for the answer, the problem must be attacked somewhat on these lines? First. If the price of gas for power in any given place were reduced (say) 20 per cent., what addition to the total output might reasonably be expected, after the arguments in favour of its use had been effectively laid before all the power users in the district of supply? Second. Assuming that 10 per cent. of the present output is used for power; that this consumption would, as a consequence of lower terms, be increased to 25 per cent. of the total output; and that of the 20 per cent. increase in total output so obtained 10 per cent. would be used when the mains would otherwise be idle—what would be the cost per 1000 cubic feet of this increased output, allowing for only such increase to capital and establishment charges as would really be involved? Third. Would the profit on the power gas be then sufficient to allow of gas being supplied for other purposes at as low a price as before, or would it be so great as to admit of an all-round reduction in price?

The answer to the first question would necessarily be speculative, and a matter for judgment rather than calculation. The last two questions admit of more exact solution; but it is doubtful if they are generally carefully considered by the advocates of cheap power gas, and it is well that Sir George Livesey has called attention to the necessity of treating the question on sound lines instead of leaping first and looking afterwards. Exactly how to estimate the cost of additional output is always a question that can be argued from different standpoints; but Sir George would, it seems to me, have little difficulty in naming the price at which his Company could profitably supply (say) another 1000 million cubic feet per annum, mainly for daylight consumption, and it would be without doubt substantially less than 2s. 3d. per 1000 cubic feet, even if coal remained at the 1902-3 price—which, fortunately, it is not likely to do.

It would certainly be interesting to see the grounds upon which a price of 1s. 6d. for power compared with 2s. 10d. for other purposes is defended. If it can be shown to combine profit from the one consumer with justice to the other, a wonderful prospect is opened up for the gas industry. But there is much virtue in an "if."

April 24, 1903.

F. G. N.

Proposed Gas Company for Hellifield.—A proposal is on foot at Bradford to form a Company for the purpose of supplying Hellifield with gas. Permission has been asked of the Settle Rural District Council to lay the necessary mains in the highways; and the Council have decided to favourably consider the scheme, subject to a Provisional Order being obtained.

A Big Profit at Rochdale.—After meeting all capital charges, &c. (including the cost of gas used in the street-lamps, which does not figure in the accounts), there was a profit on last year's operations of the Rochdale Gas-Works amounting to £23,955, of which £18,359 is available for the relief of the rates. The Committee have, however, decided to repay the £2500 taken from the reserve fund last year, and to place another £3000 to the credit of the fund in which money is being accumulated to build a new retort-house. After deducting this amount, the balance to be handed over will be £12,859, or £1004 more than twelve months ago. Though generally speaking the expenses were rather less in the past year, the bulk of the increased profit is due to the reduction in the price of coal.

Meter-Testing at Manchester.—The Inspector of Gas-Meters (Mr. S. Dyson), in his tenth annual report to the Manchester City Justices, states that the number of meters tested during the year ending March 31 was 39,902, or an increase of 3699 over the previous twelve months. Of these, 727, or 1·84 per cent., were rejected—217 wet (out of 11,331 tested), and 520 dry (out of 28,571 tested). The fees received amounted to £1432, as compared with £1114 in the preceding year. The number of dry meters tested increased considerably; and there was a decrease in the number of wet. The adoption of the index test, or what was known as the "double test," had been fully justified by results; for out of a total of 14,028 indices tested, 106 were rejected—a number of them being in the consumer's favour. Under these circumstances, Mr. Dyson thinks it probable that the double test will be generally approved, though it requires to be made compulsory by Act of Parliament before it can be adopted throughout the country.

The End of the Colwyn Bay Gas Company.—Last week a meeting of the shareholders of the Colwyn Bay and District Gas Company was held for the purpose of receiving an account of the winding-up proceedings consequent on the purchase of the undertaking by the Local Authority, and of deciding as to the disposition of the balance of the funds. According to the realization account, the total sum available for distribution amounted to £47,961, In March last year, £250 per cent. was distributed on the "A" ordinary stock and £175 per cent. on the "B" ordinary stock. A second distribution took place in August, at the rate of £50 per cent. on the "A" and £35 per cent. on the "B" stock. Amounts were voted to the Chairman, Directors, and officials, the total of which was £861. This left a balance of £5460 for final distribution; and it was decided to pay a further £38 10s. per cent. on the "A" and £26 19s. per cent. on the "B" stock. Thus the holders of the "A" stock have in all received £338 10s. for each £100 subscribed, and the "B" stockholders £236 19s. per £100.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

THE reassembling of Parliament after the Easter recess has not brought, as was expected, its little boom of Committee work on gas measures. The London Gas Bills had been looked upon as good for some smart fighting; but to the amazement of most people—excepting those who have been directly concerned in the negotiations, and those who have enjoyed their confidence—Tuesday morning (when Sir John Brunner's Committee who were to consider the Bills should have commenced their sittings) brought the intelligence that practically a settlement had been arrived at on all contentious points, and that an adjournment for about a week would, it was anticipated, find the Committee relieved of four of the Bills included in their list—namely, the London County Council (General Powers) Bill, the Commercial Gas Bill, the Gaslight and Coke Acts Amendment Bill, and the Gaslight and Coke Company Bill. The part of the first Bill which refers to gas, and the third Bill, we think it may be said, have gone definitely; the Commercial Bill has already been passed on its way unopposed; and the Gaslight Company's own Bill is so near agreement, through compromise on disputed points, that the surprise will be if on Thursday next Sir John Brunner and his colleagues are not informed that a settlement between the Company, the County Council, and the Corporation of London has been effected and duly signed. To-morrow (Wednesday) the Committee take up the consideration of the Crystal Palace District Gas Company's Bill; and that may be the only gas measure in the group that will claim their attention. The Bill, it is fancied, will be strongly contested—more particularly, it is understood, on the clauses referring to the reduction of illuminating power and the relaxation of the present restrictions in regard to purification.

The London Gas Group —A Clean Sweep.

Departmental Committee on Gas Testing in London.

The whole of this settlement in the case of the London Bills really hinges on a decision of the Board of Trade to appoint a Departmental Committee, with Lord Rayleigh as the Chairman, to inquire and report upon the question of gas testing in London, over which there has been so much discussion in recent sessions in the Committee rooms—to a large extent, in connection with the reduction from 16 to 14 candles of the standard illuminating power of the gas in the case of the South Metropolitan Gas Company and the Commercial Company. At the present moment, there now exist in London two statutory methods for testing 14-candle gas, which position was created in this way: By section 6 of the South Metropolitan Gas Company's Act of 1900, it is enacted that, in the testing of their 14-candle power gas, the burner used for testing shall be Sugg's "London" argand, and that "the burner in making such testings shall be so used that the gas shall be burnt at such a rate as to give a light equal to 16 candles." Then when the Commercial Gas Company last year introduced their Bill for authority to similarly reduce the illuminating power of their gas from 16 to 14 candles, they introduced a provision in regard to testing identical with that of the South Metropolitan Company. The London County Council opposed this; and for reasons which were fully explained by the Chairman (Mr. W. G. Bradshaw) at the last meeting of the Company, the Directors, when before the Committee who considered their Bill, agreed to withdraw the clause. This created an anomalous position in regard to the testing of 14-candle gas in London; and so it came to pass that two different measures were introduced this session purposing to right the matter in accordance with the lights of the respective promoters. In their General Powers Bill, the County Council inserted a clause having for its intention the repeal of section 6 of the South Metropolitan Act of 1900; while, on the other hand, the Commercial Gas Company—not being satisfied with the treatment they had received since the passing of their Act—introduced a short Bill for conforming the method of testing their 14-candle gas to that prescribed by section 6 of the South Metropolitan Gas Act. There were the elements here for a stiff fight, between the County Council on the one hand and the South Metropolitan Gas Company and the Commercial Company on the other. After the introduction of the Bills, the County Council addressed a communication to the President of the Board of Trade, asking him to appoint a Departmental Committee to consider the whole question of gas testing in London; and, influenced no doubt by the happenings of the last few years, he has agreed to do so. There is nothing definite known yet as to the constitution of the proposed Committee, nor as to the precise scope of the reference; but the decision of the Board has resulted so far in the withdrawal of the testing clause in the County Council's General Powers Bill and the passing forward of the Commercial Gas Company's Bill unopposed, with a new clause in it declaring that the passing of the Bill shall not prejudice any action which may be taken in consequence of the recommendations of the Departmental Committee, and limiting the operations of the Bill to three years, within which time, it is expected, the Departmental Committee will have completed their labours, and the methods of testing the gas supply in London will have been settled on a common basis. So that, for at any rate three years, the Commercial Company will be in the same position in regard to testing as the South Metropolitan Company.

The Gaslight Bills.

There remains for notice the Gaslight and Coke Company's Acts Amendment Bill, and the Gaslight and Coke Company's Bill. The first was promoted by the County Council, and the second by the Company. In the former, among other things, the Council asked that the Company's standard price for gas should be altered, the illuminating power reduced, and that provision should be made in respect of a capital redemption fund, The Company's Bill seeks an enlargement of their capital powers to the extent of £1,000,000, to lower the standard price by 3d. to 3s. 6d., and the formation of a redemption fund. The agreement, already referred to, if consummated, will comprehend the withdrawal of the County Council's Bill, and some concessions to them in connection with possibly all three main points of the Company's Bill. At the time of writing, the terms have not completely passed the stage of discussion between the parties—the Corporation having also to be considered—and therefore the nature of the terms, for the time being, are closed to publication. However, as already said, it is anticipated that Thursday morning will find the parties in complete accord.

Further Settlements and the Rickmansworth Purchase.

The Harrow and Stanmore and Wellington (Salop) Gas Bills which were in the group of measures referred to Lord Newton's Committee have, owing to agreement with the opponents, escaped their Lordships' attentions; but the latter were engaged on Thursday and Friday in considering the Rickmansworth Gas Bill, the purpose of which is to empower the District Council to purchase the gas undertaking, under the terms of a clause inserted in the Company's Act of last year. The Company appeared in opposition on preamble, though objection was taken to this by the promoters, who, in fact, sought their Lordships' decision on the question of whether the Company (in view of the provision in their last year's Act) had any right to be heard save on clauses. The Committee were against the Council on this point, and allowed the Company to be heard on preamble, so long as it was understood that they did not oppose the principle of purchase. But, later on, the Company withdrew, so far as the preamble was concerned, on an agreement being effected for the insertion in the Bill of a clause very properly imposing on the Council a time-limitation in which to complete the purchase, failing which the power of purchase will become void. A number of owners and ratepayers also opposed. They did not appear to be very highly impressed with the financial position of the district; and they were utterly opposed to the Council embarking on "municipal trading." However, their opposition was of no avail; and this was not surprising, seeing that the whole question was practically settled by the agreed insertion of the purchase clause in the Company's Bill some twelve months or so ago. The preamble of the Bill was passed. For the promoters, Mr. Alfred Colson, of Leiceter, and Mr. F. H. Jones (of Messrs. H. E. Jones and Son) appeared; but, so far as was seen, there were no expert witnesses retained for the Committee proceedings, either on behalf of the Company or the owners and ratepayers.

Tramways and Gas and Water Pipes.

In several ways the electric tramway epidemic is causing the owners of underground pipes a great deal of trouble, additional work, and some uneasiness. Tramways, however, are very useful; and the spreading electrical means of locomotion have many attractions, one of which is the rapidity of travel. Therefore no unnecessary obstruction must be set before them; but it is only just that full protection should be given to those who occupied the streets long before the advent of the new and highly favoured tramway system. There have been hard fights in the Committee Rooms to gain, in connection with the question of electrolysis, a more comprehensive form of protection for underground pipes than that provided for by the Board of Trade regulations. The result has been little encouragement. Now in connection with another point (electrolysis in this case being only regarded as a secondary matter in importance), an attempt of the South Shields Gas Company and of the Sunderland and South Shields Water Company to defend their distribution systems have been, in our opinion, most unfairly checked by the rejection in the Commons of their petitions for *locus standi* to be heard by Counsel in opposition to the South Shields, Sunderland, and District Tramway Bill, which is one of the promotions of the British Electrical Traction Company. The position of the Gas and Water Companies here is that of many other Companies in cities and towns in which the streets are narrow and winding. In such cases, a considerable alteration of mains and pipes may be necessitated by the construction of the tramway. Now in this South Shields and Sunderland Tramway Bill, Parts II. and III. of the Tramways Act of 1870 are incorporated, except where expressly varied. Section 30 of the Act gives the tramway promoters power to alter the position of gas mains or pipes, so far as it may appear expedient to them, for the construction or repair to the tramways; or the gas company may give notice to the promoters to alter the position of gas mains or pipes in such manner as may be considered necessary, should it appear to the gas company that the construction of the tramway would endanger any gas mains or pipes, or interfere with or impede the supply of gas. By the section, too, all alterations of the pipes, &c., are to be carried out under the superintendence of the gas company; and any difference as to the necessity for any alteration in gas mains or pipes is to be settled by an engineer to be appointed by the Board of Trade. Furthermore, the promoters are not permitted to remove or displace any gas-pipes, or do anything to impede the passage of the gas through the pipes, in any other manner than the gas company shall approve until good and sufficient mains and pipes shall have been laid down at the expense of the promoters in lieu thereof, *to the satisfaction of the gas company's engineer*, or in case of disagreement as a Board of Trade engineer shall direct. However, in this South Shields Tramways Bill, there is a clause (31) which has apparently been drafted as a concession to the Gas Company outside the provisions of the Tramways Act of 1870. But it is not a concession in effect; in reality, it actually exempts important protection which otherwise would be held by the Gas Company under section 30 of the 1870 Act. That this is so will readily be seen by quoting the clause as it stands in the Bill:—

> If within seven days after receiving notice from the Company of their intention to lay down any tramway by this Act authorized in any road in which any mains or pipes for the supply of gas belonging to the South Shields Gas Company are situate, the South Shields Gas Company give to the Company notice in writing of their desire themselves to execute any alterations of the said mains or pipes which may be necessary, that Company shall be entitled themselves to execute such alterations. Provided always that such alterations shall be forthwith carried out in accordance with the *directions of*, and to the *reasonable satisfaction* of, the *Engineer* of the *Company* [that is to say, the promoters] with all reasonable despatch; and the reasonable cost of executing such alterations shall be repaid by the Company to the South Shields Gas Company.

The provision here for the Gas Company themselves altering the mains

and pipes on giving notice to the promoters of their desire to do so is not provided in the Act of 1870; and this is something worth retaining. The latter part of the clause, however, is very objectionable, and in fairness should either be deleted entirely or amended so as to give the Company power to direct or supervise, through their own Engineer (Mr. T. H. Duxbury) all alterations to mains or pipes; the cost of executing the work being repaid by the promoters to the Gas Company. As the clause stands, the Gas Company may do the work themselves, but only under the direction, and to the satisfaction, of the promoters, which is entirely against the provisions of the Tramways Act. Manifestly it is also intended that the ruling of the promoters' engineer shall be final and binding, inasmuch as the usual provision for an arbitrator is not mentioned in case of disagreement. This again is directly opposed to the provision of the 1870 Act. The character of the streets of South Shields is likely to necessitate a good deal of alteration of mains and pipes. Since the Act of 1870 was passed, the method of constructing tramways has considerably altered. Wide and deep beds of concrete are now laid; and when gas-mains run along one side of the road, it is no easy matter to conduct under these concrete beds, in a proper manner, service-pipes across to the other side. However the work was done, it would be expensive. Let us take one instance from the position which the tramways will create in South Shields. The Gas Company have a line of main along 3½ miles of the proposed route; and it is intended to construct 28 lengths of double tramway tracks or crossings—the concrete bed required being 18 ft. 8½ in. wide. The road for the greater part is very narrow; and widenings are proposed at a few points. But practically the whole length of the road needs widening, as otherwise, though notice be given to the promoters to remove the mains to a position of safety and easy of access, they would not possibly be able to do it, owing to the narrowness of the road. In one place, with a double track shown, the road is only 15 ft. 6 in.; and no widening is proposed here. This means that the gas-main must perforce remain under the tram-rails there. As to the Water Company, the Bill does not include a section similar to the one (31) applying to the Gas Company; and the Company sought *locus standi*, in order that they might secure control over their own pipes, which is a very natural and proper desire. However, the Court of Referees in the Commons have disallowed the *locus* in both cases; and owners of property under roadways will, we are sure, regard the decision as very unfortuuate. However useful tramways may be, their promoters ought not to be allowed to ride roughshod over existing owners of property in the subsoil. Perhaps the Gas Company will consider it worth their while—it is hoped that they will—to petition the Lords, where better success may await them. These notes will enable readers to better interpret the position created by the Bill, than perhaps they would be able to do from the report of the proceedings before the Court of Referees.

Leigh Water Supply. The Police and Sanitary Regulations Committee of the House of Commons have a tremendous long list of Bills down for consideration; and they are attacking them as vigorously as possible. The Leigh Corporation Bill passed before them early last week, and has since been reported for third reading. One of the proposals of the Bill is for the dissolution of the Leigh and Hindley Joint Water Board; and for authorization for the construction of new works for giving an increased supply of water to Leigh. It is intended to build a new reservoir at Westhoughton for water to be obtained by agreement from the Liverpool Corporation. The estimate for the purchase of land for the water-works extension is £45,000.

Ebbw Vale and Nantyglo Water Bills. When the first of these Bills came before Mr. D. N. Nicol and the members of his Committee last Tuesday, it was apparent that the measure touched many interests at various points; for there were three Counsel, headed by the Hon. J. W. Fitzgerald, K.C., appearing for the promoters—the District Council—and something like a dozen Counsel (half of whom were wearers of the silk) were representing opponents. The proceedings on the Bill, which were spread over no less than four days, ended in a very sensible arrangement. It should be explained that the Bill of the Nantyglo and Blaina District Council was in reality a competing measure—seeing that by it it was proposed to take a portion of the same property, both water and land, and the reservoir the construction of which was contemplated was practically the same as that projected by Ebbw Vale. Now Ebbw Vale is a district with an area of some 6850 acres, containing large iron and steel works, and a population of 22,646. But the District Council have been supplying 40,000 persons altogether from their existing sources; the district of Nantyglo and Blaina taking water in bulk. It must be admitted that the existing water-works were not sufficient for the maintenance of a proper supply in dry seasons; for 1901 saw the district in very straitened circumstances for water. Hence the present Bill; and hence likewise the Bill of the Nantyglo people. Among the new work the Ebbw Council proposed to undertake was to raise the embankment of the town reservoir so as to increase the storage to 20 million gallons, and also to buy a reservoir which the Ebbw Vale Steel and Iron Company held on lease from the Duke of Beaufort. In July last there was an interview between the two Councils; and Ebbw Vale explained very openly their intentions to their neighbours. So satisfied were the Nantyglo Council with the Ebbw Vale scheme that (so it was alleged) they appropriated a large slice of it, and incorporated it in a Bill of their own. During the second day's hearing, the Chairman made a suggestion that the two Councils should take the obvious course and adopt one scheme for the whole area—in fact, he went farther and said the idea of the Committee was that one water undertaking should also embrace Brynmawr and the districts on the Clydach. This, it was the impression of the Committee, was the best thing that could happen, "knowing, as they did, what was the feeling of Parliament on the subject." The result was that the cases of the other petitioners (which mostly only referred to compensation water) were proceeded with while the two Councils conferred; and by the afternoon of the third day, their legal representatives had settled matters. The Nantyglo Bill was withdrawn—Nantyglo agreeing to take, during the continuance of the present agreement, water in bulk at the price they had already bargained for; and, at the end of that period, they are to pay less—3½d. per 1000 gallons for domestic purposes, and 5d. for trade use. Subject to a full agreement on the lines indicated between the two Councils, the Committee passed the preamble of the Ebbw Bill on the fourth day; the other opponents who had not already been satisfied by agreement, obtaining nothing as the result of their appearance in Parliament.

General. Several Committees are sitting this week. In addition to the Crystal Palace Gas Bill, and the announcement of the result of the negotiations in the case of the Gaslight and Coke Company's Bill there will be a few Bills under consideration dealing, either in part or in whole, with water. The Derby Gas Bill is at the bottom of a list of measures referred to a Lords' Committee; and the North-Western Electricity and Power-Gas Bill is entered in a group for immediate discussion. The Birmingham Corporation Bill, which contains a gas section, was expected to be taken yesterday by the Committee to which it has been referred.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Bath Corporation Water Bill, Bridgwater Gas Bill, Broadstairs Gas Bill, Burgess Hill and St. John's Common Gas Bill, East Ardsley Gas Bill, Ipswich Gas Bill, Maidstone Gas Bill, Market Drayton Gas Bill, North Middlesex Gas Bill, Sutton District Water Bill, Winchester Water and Gas Bill.

Bills reported, with amendments: Harrogate Water Bill, Harrow and Stanmore Gas Bill, Wellington (Salop) Gas Bill.

Bills read the third time and passed: Faversham Gas Bill, Hexham Gas Blll.

The Scunthorpe Urban District Water, Belfast Water, Oldham Corporation, and Derby Gas Bills were referred to a Select Committee consisting of Lord Clifford of Chudleigh, Chairman, Earl Albermarle, Lord Oranmore and Browne, Lord Farrer, and Lord Wandsworth; to meet this day (Tuesday).

The North-Western Electricity and Power Gas Bill was referred to a Select Committee consisting of Lord Glenesk, Chairman, Earl Abingdon, Lord Barnard, Lord De Manley, and Lord Aberdare; to meet this day (Tuesday).

The opposition to the Harrow and Stanmore Gas Bill and the Wellington (Salop) Gas Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read the first time: Faversham Gas Bill, Hexham Gas Bill.

Bills reported: Commercial Gas Bill, Gorleston and Southtown Gas Bill, Leigh Corporation Bill, Nelson Corporation Bill, Scarborough Gas Bill.

The Nantyglo and Blaina Water Bill was reported—parties do not proceed.

Bills read the third time and passed: Sittingbourne District Gas Bill, Walker and Wallsend Union Gas Bill.

Gas Undertakings Returns.

On the motion of Mr. Bonar Law, on behalf of the Board of Trade, there were ordered to be presented: (1) Return relating to all authorized gas undertakings in the United Kingdom belonging to local authorities for the year ended the 25th day of March, 1903; (2) Return relating to all authorized gas undertakings in the United Kingdom, other than those of local authorities, for the year ended the 31st day of December, 1902.

UNOPPOSED BILL COMMITTEE.—Friday, May 1.

COMMERCIAL GAS BILL.

This Bill on Friday came before the Unopposed Bill Committee of the Chairman of Ways and Means in the House of Commons. The measure, it was explained by the Agent for the Bill, is one to make further provision with respect to the testing of the Company's gas Last year an Act was obtained enabling the Commercial Gas Company to reduce the illuminating power of their gas to 14 candles; and at the same time it was sought to alter the method of testing the illuminating power. This was opposed by the London County Council, and struck out; and hence the Bill of this year, which seeks to bring the method of testing into accordance with that applied to the gas of the South Metropolitan Company, who obtained an Act in 1900 reducing the illuminating power of their gas to 14 candles. A Departmental Committee is about to be "appointed" by the Board of Trade to enquire into the whole question of the testing of gas in the Metropolis, and it is expected the Board will arrive at a decision in the matter within the next three years. The present Bill of the Commercial Company has, therefore, been allowed to become an unopposed measure, on the understanding that the action of the Board of Trade will not be prejudiced thereby, and that its operation shall be limited to three years. The Bill will place the Commercial Gas Company in the same position in regard to testing as the South Metropolitan Company are in for the next three years. After the clauses had been gone through, the Bill, as amended, passed the Committee, and was ordered for report and third reading.

HOUSE OF LORDS COMMITTEE.

Thursday, April 30, and Friday, May 1.

(*Before Lord* NEWTON, *Chairman, the Earl of* ROMNEY, *Viscount* BARRINGTON, *Lord* HYLTON, *and Lord* SANDHURST.)

RICKMANSWORTH GAS BILL.

This Bill was promoted by the Rickmansworth Urban District Council, to empower them to purchase the undertaking of the Rickmansworth Gas Company.

Lord ROBERT CECIL, K.C., and Mr. HUTCHINSON appeared for the promoters. The Rickmansworth Gas Company, who opposed the Bill, were represented by Mr. WEDDERBURN, K.C., and Mr. KEEN; while Mr. PEMBROKE STEPHENS, K.C., appeared for certain owners and ratepayers who also petitioned against the measure.

Lord R. CECIL, in opening the promoters' case, stated that last year the Company introduced a Bill for the purpose of transforming themselves into a statutory concern, increasing their capital from £18,000 to £100,000, and extending their district. The measure was opposed by the District Council, mainly on three grounds—namely, that the increase of capital was out of all proportion to the needs of the Company, that there was no reasonable ground for the increase in the size of the district, and that if the Bill were passed in any form it ought to include a clause giving power to the Council to purchase the undertaking. When the Bill of last year was before Sir John Brunner's Committee in the House of Commons, the Chairman expressed the view that, while the increased capital asked for was too high, it would be desirable that the parties should come to terms. They did come to terms, subject to some small question of costs; the main feature of the agreement being that a clause should be inserted providing that if the District Council introduced a Purchase Bill during the present session, the Company would not oppose it, except so far as was necessary to secure the insertion of provisions to protect the Company's interests. The clause was inserted, and the Bill was passed with modifications. In July last, the District Council unanimously decided to promote the present Bill. In November, the Council wrote to the Company offering to purchase their undertaking for a lump sum; but the Company declined to entertain the proposal. The Council were exceptionally large customers of the Company. They already took one-tenth of the whole output of gas. Having undertaken the construction of sewage works, which would necessitate considerable pumping by means of gas-engines, it was believed that, when the works were in operation, the Council's consumption of gas would equal one-fifth of the total output. The Company, in their petition against the Bill, stated that they were incorporated in 1852, and had carried on their business economically. They submitted that the Council were taking advantage of the introduction of the Bill to improve on the terms agreed to last session, and complained that the Bill fixed no time for the payment of the costs of the arbitration. They also said that no provision was made in the Bill for the possibility of the Council being unable to obtain the purchase money. They urged that special provisions should be inserted for their protection in the event of its being impossible for the Council to secure a loan for the amount of the purchase money. The reply of the promoters was that the financial position of the District Council was the same this year as last, and that the Company had therefore no right, in view of the agreement, to raise the question. They contended also that the Company were not entitled to be heard against the preamble of the Bill.

Mr. WEDDERBURN said he quite agreed that most of the opposition of the Company must be devoted to clauses; but he thought he was entitled to say that the preamble of the Bill should not pass unless the measure contained clauses which amply protected the Company.

The Committee decided that the Company might be allowed to oppose the preamble of the Bill.

Lord R. CECIL then submitted that the owners and ratepayers who petitioned ought not to be heard, inasmuch as the Bill had received approval at a meeting of ratepayers under the Borough Funds Act.

Mr. PEMBROKE STEPHENS contended that his clients had a right to be heard against a proposal which might lead to an increase of the rates. The Bill was one to enable the Council to embark on a course of municipal trading. The rates were at present 6s. 4d. in the pound; and the petitioners challenged the principle of the transfer on public and local grounds.

The Committee decided to allow the opposition to proceed.

The petition, which was then read, set forth that the Council should not be allowed to embark on a costly and speculative undertaking at the cost of the rates.

Mr. *Barton-Smith*, Chairman of the District Council, who was among the witnesses called, said that the borough funds meeting was practically unanimously in favour of the Bill. Before deciding to promote the measure, the Council made inquiries of the urban councils of about a dozen towns of similar size, who had acquired gas undertakings, as to the results of their experience. The Council thought that it would conduce to the interests of the ratepayers that the undertaking of the Company should be purchased; and it was advised by experts that the present was the best time to acquire it. The use of gas-engines for pumping at the sewage works was compulsory—Lord Ebury, from whom the Council purchased the land, having insisted on their employment. The Company had not given satisfaction to the district in regard to the quality of the gas supplied, and to their general methods and arrangements. The lump sum offered by the Council for the purchase of the undertaking was £18,500, with the addition of the £3500 on mortgage; consumable stores and plant to be taken at a valuation.

Mr. *H. Lomas*, Clerk to the District Council, said that the opinion of experts was that the effect of the purchase of the Company's undertaking would not be to burden the rates. Mr. Henderson, the Chairman of the Company, had stated, when the Company's Bill was before the Committee last year, that he did not expect the undertaking would saddle the rates. The profits of the Company were, under the present state of things, including interest on borrowed capital, nearly £1300. If there was any deficit on the purchase, it would be made up by the profit that would accrue from the extension of the business.

At this point, Mr. WEDDERBURN stated that the promoters of the Company had come to an agreement under which a clause would be inserted to the effect that, in the event of the Council being unable to carry out the purchase, the whole effect of the Bill should be cancelled.

Lord R. CECIL said he quite agreed.

Further evidence was then given in support of the preamble.

Mr. *F. H. Jones* expressed the opinion that the present opportunity of acquiring the Company's undertaking was a golden one. He stated that their average profits in the last three years were £1011, and said that if the works were better managed, and the plant enlarged, greater profits would be obtained.

Mr. *Alfred Colson*, Engineer of the Leicester Corporation gas and electricity works, also gave evidence.

Lord *Ebury* was the chief witness in support of the owners and ratepayers' petition. He said he dissented from the proposal of the District Council, because he did not think the ratepayers ought to run the risk of loss in such a matter, and because, unless there was an exceedingly good reason for municipal trading of this character, he considered that it had the direct effect of discouraging private enterprise. He was informed that his view on the subject was shared by a good many of the influential inhabitants of the locality.

The Committee eventually decided to pass the preamble of the Bill; the discussion of clauses being postponed.

COURT OF REFEREES—Wednesday, April 29.

SOUTH SHIELDS, SUNDERLAND, AND DISTRICT TRAMWAYS BILL.
The Protection of Gas and Water Pipes.

This Bill came before the Court to-day—Mr. J. W. LOWTHER presiding—for consideration of petitions by the Sunderland and South Shields Water Company and the South Shields Gas Company for *locus standi* to be heard by Counsel in opposition.

Mr. COURTHOPE MUNROE, in supporting the petition of the Water Company, said the British Electric Traction Company sought to construct a tramway from South Shields to a point near Sunderland for 3½ miles along a road occupied by a main belonging to the Water Company, and through which the water supply of South Shields, Yarrow, Sunderland, and the Tyne Docks passed. The objections urged by the promoters to the *locus* were that the Water Company were not ratepayers, had no right in the roads, and no property interfered with; and that so far as their mains were affected, they were protected under the Tramways Act of 1870. Such, however, had not been the decision of the Court in the St. Helen's case, where the Corporation were promoting electric tramways, and the Liverpool Corporation, as owners of water-mains, stated that the provisions of the Act were not sufficient to give adequate protection. The mains there, as here, were laid close to the surface. In this case, they were only about 2 feet under the surface of the road. It was also said that the provisions of the model clause as to electrolysis were sufficient to protect the Water Company; but they contended that they were inadequate.

The CHAIRMAN asked if the St. Helen's case did not go mainly on the point that it was proposed to construct tunnels and subways.

Mr. BALFOUR BROWNE, K.C., for the British Electric Traction Company, replied that the *locus* in that case was given in respect of the tunnels and subways.

Mr. COURTHOPE MUNROE said his clients wanted what the Act of 1899 would give them—a plan of construction and a description of the works. The substance of their opposition was that they desired the control of their own pipes. The attempt to do the work necessary without proper inspection was wrong. It might be that this old main would have to be moved altogether. Section 17 of the Act of 1899 left the work to be done by the promoters; and the Water Company said that any work done must be done by them. The promoters had actually granted the Gas Company a clause giving them the power to do the work themselves; but they had refused the clause to the Water Company.

Mr. GREGORY, for the Gas Company, said his case was very similar. The gas-mains ran along one side of the road, and the Company had to carry a service-pipe across to houses on the other side. The Tramways Act did not protect them, because the nature of tramways had altered. Deep beds of concrete would have to be provided for the tramway, which would prevent the gas companies carrying their pipes across the road, because they could not go through the concrete; and as gas could not be syphoned, they would be obliged to duplicate the mains. There was no provision in the Bill for this. They might also have to lower the pipes; and it would then cost them much more to carry pipes to the houses than was provided for under the Act of 1870. In regard to the protective clause, they objected that they were to do the work according to the requirements of the Engineer of the promoters. The Company, having admitted that the Gas Company should do the work, were not entitled to direct how it should be done. In regard to electrolysis, he relied upon the case of the London United Tramway's Bill, in which it was held that all the Water Companies objecting were entitled to *locus*.

Mr. BALFOUR BROWNE denied that either of the Companies was entitled to *locus*, as both were protected under the Tramways Act. By section 5 of the Act, any additional expense put on them by the construction of the tramway would have to be borne by the promoters. What had been decided was that the Act did not give protection where tunnels and subways were to be made. The case of the London United Tramways Bill was quite an exceptional one. The six Water Companies asked for leave to be heard, not on the ground that the Tramways Act was insufficient, but that the model clause was inadequate; and it was only because the knowledge of electrolysis had increased, that *locus* was granted. The matter was threshed out before a Committee of the House; and no further protection was thought necessary. If further protection were necessary, the model clause left it to the Board of Trade. Under these circumstances, it was a great pity that, when the model clause was introduced, people should be allowed to go before Committees.

The Court decided to disallow *locus standi* in both cases.

COMMISSION ON SCOTCH PROVISIONAL ORDERS.

(*Mr.* A. K. LOYD, K.C., M.P., *Chairman, the Earl of* STAMFORD, *Lord* MUNCASTER, *and Sir* WALTER THORBURN, M.P.)

The above-named Commission sat in Edinburgh on March 26, for the purpose of considering applications made to the Secretary for Scotland for Provisional Orders under the Private Legislation Procedure (Scotland) Act, 1899.

IRVINE JOINT WATER BOARD.

The first application was by the burghs of Saltcoats, Stevenston, and Kilwinning, who sought authority for the formation of a Joint Board for the administration of the water supply of the district. Objection was taken to the Order by the burgh of Irvine and by Messrs. Nobel, Limited.

Mr. WILSON, K.C., and Mr. PITMAN, appeared for the promoters; Mr. SHIRESS WILL, K.C., and Mr. CONSTABLE for the Corporation of Irvine; Mr. COOPER represented Messrs. Nobel, Limited.

Mr. WILSON, in opening the case, said that the object of the Order was to form a Joint Water Board representative of the four communities interested in a common watershed, and bearing, in proportion to their rateable value, the expense of all the works. Of the total cost of the existing works—£118,000—about £16,000 had been repaid; and of this sum his clients had contributed about 70 per cent. Under an Order promoted last year, power had been given to construct new works at a cost of £104,000, for which the three outside communities were responsible equally with Irvine. The original works—the Dykehead reservoir—were constructed under an Order granted in 1876 at a cost of £44,000. Under the Irvine Burgh Act of 1881, power was given to make a small new reservoir at a cost of £10,000; but the Town Council, instead of carrying out the provisions of the Act, extended the existing reservoir and increased the expenditure to £118,000. They had no authority whatever for doing this. Agreements were made in 1880 and 1899 with Kilwinning, and in 1885 with Stevenston and Saltcoats, for their water by Irvine. These provided that there was to be a supply from the existing works, out of the surplus of Irvine. For it the three burghs had to pay the same rate as Irvine, *plus* 4d. per £1 of rental, for five years; the extra sum being their share of the cost which Irvine had previously paid off. Up to 1885, the precise sum paid off was £2502, and the extra rate on Saltcoats and Stevenston yielded £1655. Kilwinning, under the agreement of 1899, had to pay 2½d. per £1 of rental extra. The agreements were to continue until terminated by mutual consent. Irvine, meanwhile, retained its priority clause—that it should be supplied for both trade and domestic purposes before the outside areas were entitled to any water. In 1901, Irvine, which had an almost stationary population, found that the younger communities nearer the watershed were out-distancing it in population and prosperity. Notwithstanding this, and without communication with these communities (which had almost 20,000 inhabitants as compared with 9000 in Irvine), the Town Council of Irvine introduced the Ayr Provisional Order for the purpose of getting far more extensive powers, and leave to construct works at a cost of upwards of £100,000. Irvine wanted the priority clause to continue. However, a compromise was come to; the clause was abolished, and the outside communities were made part of the compulsory limits. Irvine, however, did not show complete good faith; they did not proceed to get the Order confirmed. Last year they introduced an Order, in which they gave no effect to the agreement come to at Ayr; but the Committee sustained, as far as it could, the contention of the outside communities. The Corporation of Irvine, however, did not get the Order confirmed, and it was now suspended. During the last twenty years, the increase in the three burghs was 67 per cent., and in Irvine 12½ per cent.; the assessments from the three burghs yielded 71 per cent., against 29 per cent. from Irvine. Although they contributed so much, the promoters were denied access to the Irvine books and accounts. Irvine was the only burgh in Scotland which refused to allow the Secretary for Scotland to nominate an Auditor of the accounts. The present Order was not introduced for the purpose of transferring any beneficial interest in works or water, or to impose any additional liability. It was simply, for the purposes of administration, to transfer the power from a body representative of a section to a body representative of the whole community. It was proposed that Irvine should have five representatives on the Board, Stevenston three, Kilwinning three, and Saltcoats four—these numbers being arrived at by regarding both rental and population. The petition of the burgh of Irvine against the Order was a long and extravagantly worded document. It was true that the Council of Irving granted bonds; but the security was the several water-rates and charges authorized by the Acts of 1881 and 1902. The outside communities were seeking to take their fair share of the responsibility, and to have a voice in imposing the assessment which they had to pay. As to Nobel's Limited, Counsel argued that the firm were abundantly secured in respect of their agreement with the Irvine Town Council by the provisions of the present Order, and that their claim to have direct representation was without precedent.

Mr. COOPER said he desired at this stage to restrict his remarks to the question whether his clients had *locus standi*. The Committee on the occasion of the previous inquiry granted it. Of the total revenue of £6000 applicable to the Irvine Water-Works, Nobel's Company contributed £2000. They were therefore in the position of providing one-third of the whole revenue; while under the priority clause the Irvine Corporation could shut them off from a supply of water when the smallest trader in Irvine in times of scarcity required it. He had, however, an agreement with the burgh of Irvine; but the proposed Water Board did not safeguard his clients' interests. While the domestic rate for water in the district had been gradually reduced by the Irvine Town Council from 1s. 3d. to 9d., the rate to traders, or at any rate to Nobel's, had been increased from 4½d. fifteen years ago to 5d. now. That, on a consumption of 100 million gallons per annum, was a serious item; and it was unfair that they should in this way be subjected to taxation to cheapen the rate to other people.

The Committee decided that Messrs. Nobel had *locus standi* as large consumers having an important agreement; but the Company must confine their position to that agreement.

Evidence was then given.

At the sitting of the Committee on Saturday, the 28th ult., Mr. Cooper withdrew the objection of Messrs. Nobel to the formation of a Joint Board.

On Monday and Tuesday last week, the clauses were under consideration. After the luncheon interval on the last-named day,

Mr. WILSON said he was pleased to announce that, subject to the approval of the Commissioners, the promoters and opponents had arrived at a settlement which would obviate any inquiry by an accountant or by arbitration. The terms arrived at were, briefly stated, that a sum of £2500 should be paid by the Board out of the common funds to Irvine, the effect of this being that Irvine would be practically contributing substantially one-third of the amount; and that this sum should be paid to Irvine in full discharge of all sums that could be claimed by Irvine in respect of excess contributions towards the sinking fund, and in lieu of any claim to compensation Irvine might have. He said they had come to this arrangement about costs, that they should take the view that the inquiry at Ayr in 1901, the outlay for which had not been settled, and the expenses of the present opposition, should be regarded as chargeable against the common fund. With regard to last year, as the Irvine Corporation obtained their expenses under the Order of that year, the promoters now should have theirs in the present Order for last year's opposition—all the costs to be subject to taxation, between agent and client, by the Auditor of the Court of Session. These terms had been agreed upon on condition that there was to be no further opposition.

The Order was then adjusted.

GRANGEMOUTH WATER.

The Commissioners then proceeded to consider the application of the Grangemouth Corporation for a Provisional Order to authorize them to provide an additional water supply, and construct and maintain new water-works, and for other purposes. They ask that the limits within which they were empowered to supply water should be further defined, and that they should be allowed to supply beyond these limits. The principal works mentioned in the Order are a reservoir on the Bannock Burn, in the parish of St. Ninians, Stirling, and a conduit commencing there, passing through the parishes of St. Ninians, Dunipace, Falkirk, and Grangemouth, and the burgh of Falkirk, and terminating in the existing reservoir at Millhall. Power is sought to take water from the above-named burn, and so soon as the reservoir is completed and the waters of the stream impounded, to discharge compensation water at the rate of 500,000 gallons a day, provided the supply taken by the Town Council shall not exceed a million gallons daily, and that for additional water taken compensation water should be in the proportion of 1000 gallons to every 2000 gallons taken.

Mr. DUNDAS, K.C., Mr. COOPER, and Mr. MUNRO appeared for the promoters; Mr. SALVESEN, K.C., and Mr. M'CLURE represented the Stirling County Council, who opposed the application; and Mr. CONSTABLE was in attendance on behalf of Colonel Murray and mill-owners.

Mr. DUNDAS, in opening the case, said it was absolutely necessary that Grangemouth should have a supply of good water; and he thought the promoters would have little difficulty in satisfying the Commissioners that the Bannock Burn was naturally the most fitting and appropriate place for it to be taken from. The present supply depended on certain minor works at Millhall and Avonbridge. The water was largely derived from surface drainage and springs, was insufficient in quantity, and at times was not only bad in quality, but positively unwholesome. Grangemouth was likely to become one of the busiest seaports on the East of Scotland; and the water question had more or less been a most difficult one there. But with the recent rapid growth of the place, it had been a matter of very great anxiety to the Magistrates and to all interested in the prosperity of the town. The supply from Bo'ness had proved both expensive and precarious. The town had spent upwards of £30,000 on its present water-works, of which about £16,000 had been paid off, and the balance left was of rather recent creation, and would be dealt with in the Order. The whole cost of the new works was estimated at something like £60,000. An arrangement had been come to regarding the compensation water, and there only remained the Stirling County Council's opposition, which was really a preamble opposition, in the sense that the Council wished to see the scheme defeated, and Grangemouth left without water. In that case, he would certainly object to any general *locus* on such a question being given. In their petition, they said that Grangemouth must not take this water, because it was possible or likely that Stirling might come to want it in a reasonable time. They said in the same breath that what Grangemouth ought to have done was not to tamper with the Bannock Burn, but to come to the eastern district of the Council's source, and take water from it which would supply Grangemouth as well as everybody else for some time to come. He could not see how these two things could be reconciled. To say that the Bannock Burn lay in a different watershed from the burgh of Grangemouth was very hard to understand; and it was incorrect to say that the present scheme would provide a far larger supply than was required. With regard to the financial proposals, the promoters were prepared to offer at the end of five years, if the 4d. rate was not liked, that the Sheriff could be invoked and the rate fixed again.

Mr. SALVESEN said the two villages of Bannockburn and Whins of Milton had a water supply for which the Stirling County Council was responsible. He proposed to show that the requirements of Stirling were daily increasing. There had already been a great scarcity of water at times in these places, and with the increase in population generally they were as apprehensive as Grangemouth was with regard to its water supply. Counsel intimated that he would not adduce any engineering evidence.

Mr. *James Watson*, Water Engineer to the Bradford Corporation, examined on behalf of the promoters, said he had been Consulting

Engineer to the Eastern District Committee of the Stirling County Council, and had examined and reported on the watershed of the River Carron for the millowners. He was consulted by the Grangemouth Town Council to report upon their existing works and supply, and upon the proposed new supply. The Millhall reservoir contained 19 million gallons, and was fed by springs of a kind and by surface water, a considerable portion of it coming off lands under cultivation. The water was of a very variable character—often bad, and highly impregnated by oxide of iron, and difficult to deal with. The proposed works would be needed to meet the growth of population, and were estimated for 60 years. The Bannock Burn was less liable to interfere with any vested interests than any other stream or burn he knew of in that part of the country.

Cross-examined by Mr. SALVESEN: He considered there were great potentialities about Grangemouth. It was a first-rate shipping place. The proposed area was the natural drainage area that commended itself to him as being available for the supply of that town at a reasonable cost. He did not select Sauchie Burn, because they would have to construct a reservoir; they would have required a larger area; and the millowning interests on the burn would have been very considerable.

At this point the Commissioners adjourned till Wednesday, when further evidence was given for the promoters.

Mr. *James Stuart*, a Civil Engineer of Glasgow, said the present water area from which Grangemouth drew its supply at Millhall was very small, extending to about 50 acres, which were almost entirely under cultivation and manured from time to time. The existing works were altogether inadequate, and the water being so much derived from cultivated land was open to suspicion, and was very likely to be contaminated. As the conclusion of careful inspection, he had no hesitation in recommending the Bannock Burn supply. There was not much in the way of fishing on the stream. It was a short one, and would never be left dry, because a very large area drained into it in addition to what the promoters were interfering with; and while it would benefit the millowners to have a twelve hours' flow, the object of the Model Clause would in no way be defeated.

In cross-examination by Mr. SALVESEN, witness admitted that the Carron was entirely unappropriated in its upper reaches, and was very good water. One of the principal reasons why the Bannock Burn was preferred was that it was two or three miles nearer, and the reservoir sites were rather better. He did not agree that the Carron was the natural source of supply for Grangemouth, which was quite entitled to go to any place on the Forth.

Mr. *G. H. Hill* was the first witness called for the opponents. In answer to Mr. SALVESEN, he said the proposed supply was a very large one for so small a demand. Asked if he knew of any town which had sought to obtain a supply eight times its requirements, witness said it was quite right that authorities, when they went long distances for water, should look ahead, because the aqueduct should be made to convey a large quantity. But in the case of piping, one could always put in an additional length. Witness did not think there was any justification for the promoters seeking to appropriate so large a drainage area without making provision for the district through which the conduit passed. Following the lines of the Duke of Richmond's Commission, the villages on the route of the aqueduct should be enabled to demand a supply of water on its way to Grangemouth. He thought the town would have plenty, and could well afford to give some of it.

Cross-examined: He did not think the 3 per cent. increase in the Grangemouth population would be maintained, and he did not know that the docks now in course of construction would bring a large population to the place.

By the CHAIRMAN: There was an enormous waste of water, which could be reduced by educating the people. Some of it was due to imperfect fittings. He had on more than one occasion, when authorities consulted him, told them that if they reduced their wastage they would not need an extension of their works.

Mr. *W. R. Copeland*, of Glasgow, said he saw no justification for Grangemouth appropriating the large area contemplated; and if they gave off water it would reduce their present cost, and enable them to maintain these works much more easily. From an engineering point of view, the cost of supplying the central villages from the East Stirlingshire reservoir would be prohibitive. Grangemouth might keep its mind easy for a hundred years, even after undertaking to supply the central district.

The Commissioners adjourned to the following day.

At the opening of the sitting on Thursday, it was announced than an agreement had been come to between the parties. Its terms were that at any time after the Town Council of Grangemouth should have completed the reservoir and works, and have commenced to convey water by the conduit authorized in the Order, they should, if required by the District Committee, supply in perpetuity (in bulk) such quantity of water, not exceeding in the aggregate 350,000 gallons per day, as might be required for the use of the consumers within any special water district already formed, or to be formed, in the parishes of St. Ninians, Dunipace, and Falkirk. The stipulation was also made that the Committee should have the same right in respect of the supply as if the district or districts were within the compulsory limits; the supply to be given on such terms as should be agreed upon between the parties, or, failing agreement, to be determined by the Sheriff of Stirlingshire on the application of either party, and the terms to be subject to revision by the Sheriff at intervals of not less than seven years.

Mr. CONSTABLE addressed the Commissioners at considerable length on behalf of Colonel Murray and other millowners.

Mr. SALVESEN having replied, effect was given to an undertaking by the Stirling County Council to purchase the piping, at a valuation, in the event of a future formation of any special water supply district within the estates of Colonel Murray; provision being made that nothing contained in the agreement should affect the Council in any such future proceeding.

The preamble was then declared proved, and the clauses were gone through and adjusted.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, April 30.

(*Before Mr. Justice* JOYCE.)

Attorney-General v. Mayor and Corporation of Barnstaple.

Supply and Maintenence of Electric Light Fittings.

This was an action brought to decide the question whether the Corporation of Barnstaple, who in 1900 obtained a Provisional Order to enable them to supply electricity within their area, are entitled to supply and maintain private installations—*i.e.*, to wire houses of consumers, and fit up lamps, &c.

Mr. YOUNGER, K.C., and Mr. CANN appeared for the plaintiffs; and Mr. HUGHES, K.C., and Mr. MACSWINNEY, for the defendants.

Mr. CANN, who opened the case in the absence of Mr. Younger, said the action was brought under the fiat of the Attorney-General at the relation of Mr. Chandler; and the object was to restrain the Corporation from supplying private installations for electric lighting in private houses. Under their Provisional Order of 1900, the defendants, in 1901, borrowed £21,600 on the security of the rates, for the purpose of carrying out the powers they had obtained; and down to the close of 1902 they had expended £1610 out of this borrowed fund in their private installations, which he should submit they had no power to do. In June, 1902, they issued a circular, signed by the Town Clerk, offering to supply consumers of electricity with fittings, spreading the payment over a certain number of years, and to keep the fittings in repair during that period. On Nov. 15, 1902, the writ was issued.

Justice JOYCE asked if this was a case of municipal trading.

Mr. CANN said it was. He understood that it had the distinction of having been mentioned in Parliament. The President of the Board of Trade had been asked to express some view upon it which might assist his Lordship; but he declined to do anything of the kind. Counsel then proceeded to read various sections from the Electric Lighting Acts of 1882 and 1899, and of the Public Health Act, 1875, one of which provided that money borrowed under the powers of the Act should only be for the purpose of permanent works.

Friday, May 1.

On the resumption of the proceedings this morning,

Mr. CANN concluded reading the sections which he thought material, and then proceeded to the pleadings. The defendants said they had, under the general law and under the Provisional Order, the power of supplying within the borough, and also, with the consent of the consumers, to set up wires, lights, and other fittings for the purposes of the supply. They denied that they threatened and intended to continue doing this; but they had issued a circular offering to do so.

Mr. HUGHES said they did not intend to do it any further; they had done all they wanted.

Justice JOYCE: Have they really dropped this?

Mr. HUGHES said the position was this: For the purpose of starting the undertaking, the Corporation had done this, and had wired houses to a certain extent; but they did not want to do it in future.

Mr. YOUNGER said they had undertaken to maintain the wiring they had put into houses for three years. This abandonment—if it had taken place—had only been within the last few days; and he understood the right to do it was persisted in.

Justice JOYCE said the action seemed to resolve itself into one to prevent the maintenance of these wires for a short time. Was it worth while objecting to that?

Mr. CANN said he did not know what undertaking his friend was prepared to give. He might say at the present moment they did not intend to do any more. That was a mere expression of opinion; and when the terror of this action had been dissipated, they might take a different view.

Mr. YOUNGER understood the Corporation desired there should be a judicial determination of the question at issue as to their right to do this. It was a question of municipal trading.

Justice JOYCE said he did not sympathise with any desire of that sort. He should not decide anything but a practical question.

Mr. HUGHES said the position of the Corporation was this: They borrowed £21,600 for the purpose of electric lighting, with the sanction of the Local Government Board. They found that the people of Barnstaple did not understand much about electric lighting, and were rather shy of taking a supply unless the Corporation would wire the houses. It was all done out of the borrowed money, and separate accounts were kept. It was not done out of the rates, though, of course, the money was borrowed on the security of the rates. In many cases the customers had paid cash for the work done; so that it had come back, with a small profit. The number who had not paid was, he believed, 14; and the repayment was in some cases spread over a term of three years.

Justice JOYCE: It is quite plain you have been advised not to go on.

Mr. HUGHES said he did not think that was so. At the commencement, there was no tradesman in the town who could do the work; but now there was, and there was no necessity for the Corporation to go on with it.

Mr. YOUNGER said he should not think of asking that the Corporation should be restrained from carrying out any contracts they had entered into. If his friend would submit to a declaration—he would not ask for an injunction—that the defendants were not entitled to do this and pay the costs, he would ask for no further relief.

Mr. HUGHES said if his friend was going to ask for the costs, he must establish his right to an order.

Justice JOYCE said the only question left seemed to be the costs of the action.

Mr. HUGHES said the plaintiff was one of the Directors of the Gas Company. There was no objection on the part of the ratepayers at all; they were all in favour of it. His contention was that the Corporation were entitled under their general powers to do what was complained of. It was not like the case of the London County Council running omnibuses, or the Great Eastern Railway Company making engines, both of which were held to be *ultra vires*, because in those cases the respective bodies were limited to the powers conferred on them by statute or charter.

Justice JOYCE expressed the opinion that the pleadings required amendment if this point were to be raised.

A discussion ensued as to whether the case should stand over for an amendment, and as to the costs of such adjournment; his Lordship expressing the opinion that the defendants would have to pay the costs up to the present time, unless they succeeded in showing that they were justified under the Provisional Order and the Electric Lighting Acts. A conference then took place between the parties; and Mr. Hughes said that, subject to the consent of the Attorney-General—which, no doubt, could be obtained—an arrangement had been made. He stated formally that the Corporation did not intend to do anything further in the direction complained of, except so far as they were under an obligation to do so. In pursuance of existing obligations there would be no declaration or injunction, and an arrangement had been made as to the costs of the action. Of course, it would be understood that the Corporation could put up lamps and fittings on their own property.

Smart Sentence on a Prepayment Meter Thief.

The Plymouth Magistrates on Wednesday last sent to prison for three months with hard labour a man named Charles Wright, who had stolen 2s. from a prepayment meter in the house where he lived. Mr. R. B. Johns, who prosecuted for the Plymouth and Stonehouse Gas Company, said that cases in which meters were broken open and the money stolen were becoming very numerous; and he asked that the prisoner should be made an example of. Wright, who was described by the police as "a bad lot," only came out of gaol in March last.

Discharging Chemical Refuse into Sewers.

At the Manchester City Police Court recently, Messrs. Hardman and Holden and the Manchester Oxide Company were summoned for allowing chemical refuse to flow into the sewers, in contravention of the Public Health Acts. It was stated that there had for some time been complaints from the inhabitants of the Miles Platting district as to the fumes which ascended from the street-grids. The matter culminated in an explosion, which occurred in 1901. As the two chemical firms named were the only ones that turned refuse into the sewer concerned, attention was naturally directed to them. A sample subsequently taken from a point in the sewer where it could only be the effluent from the Manchester Oxide Company's works was found to contain carbon bisulphide and a quantity of hydrocyanic acid. It was admitted that they had done everything possible to prevent a repetition of the trouble. The Stipendiary said there had been an offence; but as the whole thing had been remedied, there was no reason for imposing a heavy penalty. He inflicted on the Manchester Oxide Company a fine of 40s. and costs, with £10 10s. extra costs. Messrs. Hardman and Holden, who were summoned for having turned into the sewers liquid heated to over 110° Fahr., were fined 40s. and costs in one case, and 20s. and costs in four others. Mr. Sutton, who defended, said he had come to the Court prepared to show that the two works were carried on as well as any in the kingdom were or could be; and the firms emphatically denied that the explosion was due to them.

Use of Gas in Workshops.

At the County of London Sessions last Thursday, before Mr. Loveland-Loveland, K.C., Deputy Chairman, Peter Robinson, Limited, appealed against two convictions at Marlborough Street Police Court for failing to keep their workshops at a reasonable temperature. The facts of the case were given in the "JOURNAL" for March 31 (p. 853). The rooms, which were heated by steam-pipes, were visited by an Inspector, who alleged that they were then too cold; the temperature being from 54° to 61° in the different rooms. In some of them, gas was found burning. Medical witnesses stated that the temperature in such workshops should be from 60° to 65°; and that the use of gas for heating would vitiate the atmosphere. The appellants, however, denied that the gas was burnt for the purpose of warming the place, and said it was used only for lighting. They called evidence to the effect that 56° to 60° was a reasonable temperature; and the forewoman stated that none of the workpeople had complained of the cold. The appeal was allowed, with costs.

Embezzlement by a Gas Collector.

In the Sheriff Court at Glasgow, on the 27th ult., Robert Lindsay, a well-dressed, elderly man, admitted that during the first quarter of this year he embezzled a sum of £587 while acting as a Collector for the Coatbridge Gas Company. An agent stated that the accused, who was 52 years of age, was a native of Coatbridge. He had been for twenty years in the employment of the Company, and his salary was £120. He was responsible for the collection of from £7000 to £8000 per quarter. He got into difficulties, and ultimately indulged in Stock Exchange speculations, which turned out unsuccessfully, and resulted in placing him deeper in debt to his employers. Sheriff Mitchell, after consultation with Sheriff Fyfe, said it was a serious case. The fatal mistake was his yielding to the temptation to speculate, in that way involving risk to the Company as well as to himself. He passed sentence of six months' imprisonment, and expressed the hope that accused's character would stand him in good stead when he was liberated. The prisoner absconded about a month ago, but was arrested in Belfast.

MISCELLANEOUS NEWS.

A MODEL GAS EXHIBITION AT CROYDON.

"If a thing is worth doing at all, it is worth doing well" is a hoary but wise maxim that, with passing years, has been largely lost sight of in the organization and conduct of local gas exhibitions, with the result that there have been, among the many exhibitions held during late years, few that have appealed to us—we may specially mention the Newcastle and Grantham Exhibitions as two that have—as being on a scale and of a character that can be described as good, and which has represented the business side of the gas industry in a degree proper and adequate to its importance. The process of degeneration has been a gradual one. Well do we remember the time—say, ten or so years ago—when local gas exhibitions were conducted on a far more imposing level than they have generally attained of late; and yet there is really no excuse for this. The resources of the gas manager are not more limited now than they were a decade ago. On the contrary, as a few sentences will show. In the sphere of lighting, there has not been a pause in improvement; the pace in that respect has been vastly quickened in recent years. In cooking and heating appliances too, if we cannot point to any great change, every manufacturer has introduced constitutional improvement in both gas ranges and fires and new and higher grades of external embellishment in the case of the latter. The former have tended to increased efficiency, to the enhancement of usefulness, and to the promotion of cleanliness. With the expansion in the field from which to make an exhibition attractive, and in the face of so much life, it savours of a peculiar affection that has produced so much morbidity in this particular regard. In a leisure hour, when travelling, an occasional visit has been paid to so-called gas exhibitions to which public attention has, in some cases, been drawn by flaring posters which would have done justice to the lively imagination of the manager of an itinerant circus. A few minutes' inspection of the shows themselves has had a repellent rather than an alluring effect; and the dreary spectacle of a few gas-stoves placed in a large hall, and a small and insufficient attempt at displaying the beauties of the incandescent light, have sufficed to drive us to the outer world again after but a few minutes' stay. It is exhibitions of this kind that have brought about their deserved disrepute in the eyes of the public in many towns, and have made them of little avail as business-promoting agencies. Whether this is due to the official managers or to their directorates and committees, it is not for us to say; though we have an opinion as to the direction in which the lethargy is to be found.

The speculation of the money sufficient to bring about something really inviting to a community of varied tastes, will not in many quarters be heard of. It is the housewife who takes an interest in cooking and heating stoves, and who likes to see how a kitchen should be fitted up, or a drawing-room, dining-room, or a bed-room heated and lighted; and in these matters the daughters of the house, too, may be induced, by pretty furniture and draperies, to take an interest. These things, when properly presented, will also engage the attention of paterfamilias, who, if he happens to be a business man, will furthermore be interested in illustrations of how to light his office and shop. Then there are others of a studious turn of mind who are attracted by models and pictures which are informative as to how gas is made; and instruction in this regard turns attention to the proper utilization of the gas. Again, there are others who can only be brought into the presence of the real objects of an exhibition by the influence of something foreign to those objects—say, music. In short, in organizing an exhibition, it should be remembered that tastes are as varied among a large number of people as their requirements; and in order to attract and tempt, both must be catered for. A good gas exhibition organizer almost requires the ability of a popular music-hall manager, in order to please and sustain interest throughout six or more days; and—directors and committeemen this is an important point—he must have the wherewithal to do these things, and time to specially devote to the work. The animadversions passed on a type of exhibition which we hope will be little, if at all, seen again, must not be taken to apply everywhere. Of course, where the cap does not fit, it would be ridiculous for it to be worn; but it is a matter for regret that the cap is of the proper size for so many heads.

How, then, should a local exhibition be conducted? is a fair question to put in return for this criticism. For reply, we cannot do better—though there may and have been a few equally good examples in recent years—than direct attention to the exhibition that was held at Croydon last week in the Large and Small Public Halls, which are adjoining and convenient buildings for the purpose. As a successful exhibition organizer, the Engineer and General Manager of the Croydon Gas Company (Mr. J. W. Helps) has before proved himself. On this occasion, however, he excelled his previous efforts; and during the whole of last week he succeeded in drawing and interesting a large number of people. In fact, the exhibition was nightly an animated scene, the visitors coming and going in an almost continual stream; and no one who left the exhibition could have failed to have been impressed, interested, and instructed. There was an abundance of lighting by various incandescent systems; six stands displayed the wares of as many firms of gas stove and fire makers; a complete suite of well, and yet daintily, furnished rooms, in which nothing (even to floral decoration) was omitted, demonstrated how the home should be lighted and heated; past and present methods of utilizing gas were brought in juxtaposition; relics of days long since were introduced here and there among the like of modern production—thus intensifying the advance that has been made; models of all parts of gas manufacturing plant were on view; photographs and plans placed on convenient stands or on the walls within range of vision; the chemical side of the industry was in evidence; the actual instruments used in testing gas for purity and illuminating power were there to enlighten those whose knowledge in many cases did not extend to the existence of such things; and gas appliances for other than domestic use were on view. Every evening,

in the School of Art room, well-attended lectures on the manufacture of gas, framed in popular language and illustrated by lantern slides, were delivered by Mr. Helps; and, afternoon and evening, Miss M. Ball gave attractive demonstrations in the art of cookery—using the stoves of the exhibitors. Not only were Miss Ball's lectures highly interesting, but the audiences were interested in that lady herself, as she came before them with a freshly-won laurel—having been the winner of the first prize in open competition for omelette making at the cookery exhibition at the Albert Hall, before the Prince and Princess of Wales, on the previous Friday. Another feature was that in the supper room attached to the small hall afternoon teas were dispensed at popular prices; and at brief intervals for two hours, both afternoon and evening, Rowland Clarke's Anglo-Viennese Band discoursed the sweetest of music.

This suggests a mention of the catalogue of the exhibits and the programme of music which had been prepared for the information of the visitors. It is worthy of notice, if only as a "wrinkle" for those who are not above taking hints in management from a successful effort. This little pamphlet consisted of 32 pages (two of which were left blank for notes by the visitors), and was bound in a delicately tinted paper cover. It comprised a full catalogue of the exhibits, and programmes of the lectures and music for the whole week. Interlarded among the exhibits in suitable places was information on the subject of cooking, and as to what the Croydon Company are doing, and are prepared to do, in the way of instruction in that art. Gas fires and the question of heating by gas were treated upon in a couple of pages; the Company's own little advertisement being also introduced. Incandescent lighting—high power and ordinary—brackets, burners, chandeliers received due notice; and another page contained information on the subject of indoor lighting and maintenance. Separate spaces were occupied with particulars as to the various other domestic uses of gas, and the purposes to which gas can be applied in industrial operations.

This outlines the model exhibition, which will be more particularly dealt with presently. Mr. Helps and his Directors must indeed be complimented on the character and completeness of the display; and its success as a centre of attraction in Croydon during the week.

The Opening.

Before taking a hasty glance round the exhibits, brief reference to the opening is called for. It was performed by Alderman Page, the Deputy-Mayor, who had, during the little ceremony, as companions on the platform of the large hall, some of the Directors and officials of the Gas Company—viz., Mr. Charles Hussey (the Chairman), Dr. Adams, Mr. Rigby, Mr. W. J. Russell, Mr. W. Topley (Secretary), and Mr. Helps. In a few observations, Mr. Hussey gave full credit for the initiation of the exhibition to the last-named gentleman; and in a happy reference to Alderman Page's presence that day, he said it linked the Gas Company closer than ever with the names of Page and Overton, for it was in 1847 that Mr. Overton had the pluck to start the gas-works in Croydon. In 1850, he added, when the Company took over the undertaking, the quantity of gas made and sold was 10 million cubic feet; this year they hoped and believed it would amount to 1000 millions. In 1850, the storage capacity was 100,000 cubic feet; now it was 5¼ million cubic feet. At the time Mr. Overton's property was purchased, the price charged for gas was 15s. per 1000 cubic feet; the Company immediately reduced it to 7s.; and now it was 2s. 8d. At the present time, the consumers numbered 19,500; and the Company had between 10,000 and 11,000 cooking-stoves on hire. After such a record, the congratulations of Alderman Page on the successful way in which the Directors conducted their business was not by any means misplaced or superfluous. In an apposite little speech, he declared the exhibition open; and subsequently he accepted from Mr. Helps a handsome volume, containing photographs of the works as a souvenir of the occasion.

The Exhibits.

We have only space to take a rapid glance at the numerous exhibits. Outside the large hall, the space in front of the main entrance was lighted by four powerful lamps, supplied by the Scott-Snell Self-Intensifying Gas-Lamp Company, the Welsbach Incandescent Company (self-intensifying), Moffats Limited (Lucas), and Messrs. W. Sugg and Co. In these installations (and the same may be said of the interior work), there was nothing of the makeshift about the manner in which the work was done; it was carried out with that excellence and attention to detail which should mark permanent erections.

In regard to the exhibits in both the large and small halls, they will be dealt with, as far as possible, in the order in which they were catalogued. The preliminary recognition must, however, be made that the exhibitors showed, by the completeness of their stands, that they had collaborated heartily with Mr. Helps in his aim to achieve to something of the first order.

Cooking and Heating.

Stand No. 1 was in the possession of the Davis Gas-Stove Company, Limited, and an excellent display they made; their several attractions being enhanced by a bread-baking demonstration daily. The stand contained cooking-stoves, double roasters, a specimen of the "Diamond" portable furnace, grillers, boiling-stoves, hot-plates, gas-fires, boiling-burners, reflector fires, condensing-stoves, water-heaters, &c.—all finished in perfect style. The well-known and popular "Metropolitan" cooker naturally had a large representation; the enamelled steel linings, removable burners, loose top plates, and the simple but effective wire grillers, being among the features to which notice was directed by the attendant. The assortment of gas-fires on the stand was also good. No. 2 stand was furnished by Messrs. Fletcher, Russell, and Co., Limited, with an excellent collection of their high class goods—chief among which were specimens of their cooking-stoves, fires, "Rapid" water-heaters for baths, water-boilers, and cooking utensils. Every day the efficiency of the firm's stoves was proved by the baking of bread; and several fires and ranges in operation also commanded attention. A number of gas-fires of artistic design and enamelled in a variety of colours were the subjects of much appreciative reference by visitors.

A highly interesting stand was No. 3, which was tenanted by Messrs. Wilsons and Mathiesons, Limited. It was packed with the productions of the firm. One of their "Register" fires—small in size but a powerful giver of heat—constrained passers-by to pause. This little fire (which at 10-10ths pressure consumes full on 22 cubic feet of gas an hour) is intended to be fitted into an ordinary coal grate. It has not a great depth of fuel, but for such a small fire it presents to view a large incandescent surface. It is fitted with a duplex burner, the back half of which can be turned out if necessary, leaving only the front half alight. It is said that in the North, these "Register" fires are going well in connection with slot installations. The firm were also showing the "Register" fires cased so that they can be set in front of, without interference with, the modern type of coal-grates, so completely covering them that to all appearance they constitute a part of the original fireplace. This design has a movable canopy, by which the draught can be regulated. It is an altogether nice piece of work; and it bridges over the difficulty occasioned by the conservatism of builders in preserving the days of the coal-fire. There was one other feature of this stand that deserves mention; and that was a combination coal and gas range for kitchens. The positions in which gas cooking stoves are fixed in an ordinary house more often than not cause them, while they are a great convenience, to be obstructions to the free use of the kitchens; and when boiling, grilling, or frying is proceeding, they are at times somewhat offensive, if they are not supplied with a ventilated canopy. But if builders can be persuaded to make the kitchen mantels a trifle wider, and fix in the coal range provided for this combination, they will find, we are assured, that it will not cost them any more than the ordinary coal range, and yet it will add another attraction to their property. The coal-fire occupies one side in the chimney opening; and the gas-oven sets nicely into the recess left on the other side. It cannot obstruct there; and all the fumes from the cooking have a direct outlet up the flue. With tiled sides and back to the recess, the whole arrangement has a clean and compact appearance which would give delight to housewife and servants. When the coal fire is not in use, a circulating hot-water supply is furnished by a specially devised cylindrical water-heater, with burner underneath. Another form of the combination range has a well coal fire and oven at a low level; and, in this case, the gas-cooker is fixed over the hot plate—bringing it to a very convenient height for use. Though there are many other good exhibits on this stand, we must pass on.

Stand No. 4 was occupied by the Richmond Gas-Stove and Meter Company; and among their exhibits were several which were much admired. The goods on view comprised domestic labour-saving appliances, the Richmond "Model" gas-cookers with movable burners, &c., gas heating stoves with enamelled exteriors in a variety of colours, "Rapid" bath heaters, instantaneous water-heaters, and special cooking apparatus. The special features of several of the Company's new designs have from time to time received commendatory notice in the "Journal;" and we are told that that commendation has been justified by their increasing popularity. The numerous examples of Messrs. John Wright and Co.'s specialities made an imposing display on Stand No. 5; cooking-stoves, grillers, hot-plates, boiling-burners, gas-fires, water-heaters, hot-water apparatus, &c., being noticed. But in their "New Century Eureka," presenting as it does several handy improvements, most interest was found. The oven is lined inside and out with enamelled steel sheets, and is packed with patent non-conducting material. The effective area of the oven is larger than in their previous patterns; this increase having been achieved by the very simple device of recessing the gates which support the shelves. This change gives to the No. 407 stove a width of oven space almost equal to No. 410. Then the top burners instead of merely being slotted to drop over the connecting supply-pipe, are now made to slide into the connection. The griller is constructed in two pieces; and, by a handle, these can be turned from the flat into a sloping position—thus, ∧. The hot-plate is hinged, and lifts up. All the burners, burner supports, and grill plates are loose, and can be removed, leaving a clear space above the crown plate for cleaning. By a new contrivance, too, the loose hot-plate bars are prevented from falling out when the cooker top is hinged right back. When the top is shut down, it locks all the burners and other loose parts in position. This combination in the "New Century Eureka" of the firm's latest improvements will, there can be no doubt, gain for the stove the favour which it is believed it merits. On the opposite stand (No. 6), Messrs. Arden Hill and Co. demonstrated that they are making continuous efforts to maintain their claim to the title of "Acme" for their productions. Samples of their well-finished cookers, grillers, gas-fires, &c., were on view; but notice must be confined to two. To meet the demand for a cooking-stove which will not occupy much space, but shall possess the convenience of four boiling-rings on top, they have adapted their No. 226 cooker so as to meet that requirement. The whole of the burners in this cooker are removable; and, inside the oven, the shelves are hooked at the rear ends so that on withdrawing for the examination of the food being cooked, accident is prevented. To release the shelves for cleaning, they must be tilted before they can be taken out. The firm's new design of griller is also worth special notice. It has a sliding base-plate on which the tin stands when the griller is in use. The base plate and whatever is being cooked are drawn out together; and the action automatically opens the doors, while the return of the plate closes them.

There was a good tone about the whole of the gas-stove stands; and it would be an invidious task to have to discriminate between them on the point of superiority of goods. In this notice, we have confined ourselves to points in the various firms' manufactures to which attention has not been specially directed previously in these columns.

The Lighting Exhibits.

The James Keith and Blackman Company's exhibit next falls for notice. The largest piece of apparatus on the stand was one of their automatic compressers, which was in use for the supply of six clusters of burners lighting the large hall; each cluster having an illuminating power of about 1000 candles. The Company exhibited the several forms of lamps that they are making for outside and interior lighting,

in connection with the high-pressure system. All of these lamps were fitted with high-pressure burners; and their efficiency was abundantly demonstrated. The various parts of the lamps, too, were exposed to critical inspection. To show visitors the marked strides that have been made in gas lighting, Mr. Helps had a range of old type flat-flame burners, ending with incandescent lights, fitted to one pipe. Being in line the advance made could be readily distinguished; and little blocks of wood of varied heights supplied an object-lesson in the relative efficiency of the burners. The New Inverted Incandescent Gas-Lamp Company had a stand fitted with their lamps. This was a pretty and very effective display. The Automatic Light Controlling Company, Limited, showed a series of burners fitted with their apparatus for lighting and extinguishing public lamps at predetermined times. This is the Gunning system, upon which a paper was read at the last meeting of the Gas Institute, and before then a description appeared in the "JOURNAL." The Telephos Company, too, exhibited their automatic arrangement, whereby any lamp or series of lamps can be turned on and lighted, or turned off by an ordinary switch from any desired point. This system was also described some months since. Although out of the order in which it appeared in the catalogue, the stand of Messrs. William Sugg and Co. should be referred to in this section. It was a large stand, and was closely fitted with a good selection from the firm's productions in connection with incandescent lighting. It was altogether a brilliant display; and it attested to the firm not having spared themselves in making it so. The Christiania incandescent burners and fittings were a prominent feature. With these, and a consumption of 5 cubic feet of gas an hour, Mr. Sugg gets by actual photometrical tests, the excellent result of 120 candles. Among the novelties was a billiard light. This is a horizontal incandescent burner, simply curved upwards at the lighting end. The mantle is suspended on a metal rod, ⌐ shaped and with steatite end, fixed on to the horizontal part of the burner. There is no downward shadow; and the method of supporting the mantle is said to prevent accident in the event of a careless player striking the burner with his cue. A number of street-lamps were also shown here; and among them the new "Windsor" claims notice as being a strong lantern embodying several exceedingly good points. It is built with steel ribs, and is made with a cast-iron base, which simply screws direct on to the top of the column. It is made with a separate air inlet and outlet in the roof. The one exhibited was also fitted with Mr. Charles Carpenter's igniting flash-jet. This is carried above the top of the mantle; and, when not in action, there is nothing but a blue flame inside the cap at the "business end" of the arrangement. The lamplighter merely touches a cock outside the lantern with his torch, and simultaneously the gas-way is opened to the burner, and a luminous jet flashes out of the igniter across the top of the mantle. The "Chertsey" lamp, fitted with five burners, and giving a total illuminating power of 800 candles, was also shown. This stand was situated in one corner of the small hall, which, it is convenient to mention here, was lighted by 22 incandescent burners fixed on pendants carried by pipes running along the side walls. From the ceiling depended 40 16-candle power incandescent electric lamps, with which the hall is ordinarily lighted; and, now and again—the incandescent gas-burners being fitted with a Bartlett regulator, which enabled them to be turned on and off from one fixed point—an ocular demonstration (without words) was made of the superiority of these over their competitors. In regard to cost, it was learnt that, at 5d. per unit, the electric lighting of this hall works out to 14d. an hour, as against 3¼d. for the incandescent gas lighting.

A Suite of Rooms.

A complete and artistically furnished suite of rooms at the end of the large hall was the centre of much admiration; and the display showed how domestic lighting should be done. The rooms were furnished by Mr. Alfred C. Ebbutt, a tradesman of good local repute in this particular line. The drawing-room was lighted by the New Inverted Lamp Company; and the depending lights, with their pretty beaded hangings, were extremely pleasing. The dining-room was illuminated by Messrs. H. Greene and Sons, Limited, with incandescent burners—fitted (over the table) to a "Surprise" pendant and to five wall brackets. In the bed-room was an incandescent light over the bed, and two above the dressing-table. These lights and those in the dining-room were lighted and extinguished by the apparatus of the Telephos Company. A bath-room was fitted with water-heating arrangements by Messrs. W. Sugg and Co. On the stage at the opposite end of the hall was a model kitchen suitable for an hotel or other extensive establishment. Large and handsome were the several types of apparatus with which it was equipped. The cooking-range was by Messrs. Fletcher, Russell, and Co.; a double oven roaster by the Davis Gas Stove Company; a carving-table by the Richmond Gas Stove and Meter Company; a hot-plate by Messrs. Arden Hill and Co.; a hot-water circulating boiler by Messrs. John Wright and Co.; and a hot-water boiler by Messrs. Wilsons and Mathiesons, Limited.

The Industrial Uses of Gas.

In this section Messrs. Fletcher, Russell, and Co. supplied a good collection of appliances; and elsewhere a 1-horse power Crossley gas-engine was seen driving a small printing-press.

Miscellaneous Exhibits.

Very interesting and instructive were the miscellaneous exhibits neatly arranged and labelled in the small hall. Models, photographs, drawings, and apparatus gave the visitor a good insight into the manufacturing, chemical, and historical sides of the industry. The contributors were: The Croydon Gas Company, drawings, photographs, models, and laboratory apparatus; Mr. Henry Hack, a complete model gas-works; Messrs. George Bray and Co., a sample show-case of burners, &c.; Messrs. W. Butler and Co., specimens of colours and other articles produced from coal tar; Messrs. W. J. Jenkins and Co., model of a De Brouwer coke-conveyor; Messrs. W. C. Holmes and Co., models of machines for the extraction of ammonia and cyanides and models of a double-faced valve and retort mouthpieces; the Consolidated Petroleum Company, model of a carburetted water-gas plant; Messrs. H. Greene and Sons, Limited, model of plant for the manufacture of sulphate of ammonia; Mr. Charles Carpenter, model of the framework, &c., of one of the East Greenwich gasholders (capacity 6 million cubic feet); West's Gas Improvement Company, Limited, models of manual stoking machinery for charging and drawing retorts, also showing elevator and storage hopper; Messrs. Alex. Wright and Co., Limited, Simmance and Abady's rapid-reading photometer, for use in connection with carburetted water-gas plant, and Simmance and Abady's patent calorimeter: Messrs. William Sugg and Co., Limited, small model of gas-works; Messrs. Parkinson and W. & B. Cowan, Limited, wet, dry, and prepayment meters in glass cases, model of coin movement, model index of meter, model governor with valves, &c., complete; Messrs. Thomas Glover and Co., Limited. glass models of dry and prepayment gas-meters, the first meter manufactured by the firm, a patent service cleanser, pressure-gauges, &c.; The Gas-Meter Company, Limited, glass models of slot and ordinary meters and a cooking-stove meter; the Gas and Mechanical Speciality Company, duplex burner tester, anti-vibrator for incandescent burner, portable pressure register, and water-gas cycle recorder; Messrs. Bryan Donkin and Clench, Limited, models of gas-exhausters, gas-valves, &c.; Messrs. G. Waller and Son, model of gas-exhauster, &c.; Mr. S. H. Kimbell, stove made prior to 1840, by Mr. T. Sharp, of Northampton, and in constant use for 44 years (this was the stove described in the "JOURNAL" for April 22, 1902); Mr. V. Hughes, some pieces of cast-iron pipe, originally used between the house of William Murdock and the Soho Works Birmingham, in the year 1794 (close by was a bust of Murdoch); and Messrs. Mobberley and Perry, and Mr. G. King Harrison, models of gas-retorts and other fire-clay goods.

This completes the description of this thoroughly organized exhibition; and it is only because we regard it as an example for a local exhibition that so much space has been devoted to it. The hints this account contain are many; and their adoption cannot fail to contribute to a triumphant issue to similar ventures.

BRUSSELS MUNICIPAL GAS SUPPLY.

Report of the Gas Committee for the Past Year.

The report of the Gas Committee of the Brussels Municipality for the year ending Dec. 31 last, which has lately been issued, shows that the total quantity of gas sold was 35,563,277 cubic metres, or about 1255½ million cubic feet, compared with 35,353,563 cubic metres, or about 1248 million cubic feet, in the year 1901. The total production of gas reached 41,681,230 cubic metres, or about 1471 million cubic feet, against 43,315,380 cubic metres, or 1529 million cubic feet, in the preceding twelve months. The entire bulk of gas was disposed of as follows:—

	Cubic Metres.
Lighting	26,722,126
Municipal and other establishments	1,344,648
Gas-engines	3,669,461
Heating purposes	3,528,640
Illuminating devices, balloons, &c.	80,255
Artisans' dwellings and miscellaneous	218,147
Total sold	35,563,277
Public lighting and illuminations	3,591,442
Used on the works, &c.	1,391,313
Unaccounted for	1,135,198
Total production	41,681,230

The total receipts amounted to 6,469,277 frs. (£258,771), and the expenses to 4,512,473 frs. (£180,499); leaving a balance of 1,956,804 frs. (£78,272). From this had to be deducted the amount by which the stores had decreased in value—viz., 178,306 frs. (£7132)—so that the net balance was 1,778,499 frs. (£71,140), against 1,664,659 frs. (£66,586) in 1901.

The portion of the report dealing with the manufacturing operations shows that 95,836 tons of coal were carbonized, and 5026 tons of oil employed for enrichment, &c., last year, compared with 134,346 tons and 2586 tons respectively in 1901. The bulk of solid material was consequently less by 38,510 tons, and of liquid more by 2440 tons. The quantity of coke sold in Brussels and the neighbourhood was 856,691 hectolitres (about 2,356,000 bushels), against 856,376 hectolitres (about 2,355,000 bushels) before. Tar products were less difficult of disposal last year than in 1901, and they were sold at remunerative prices. The sulphate of ammonia also was all placed on advantageous terms. On the other hand, the cyanides market was in anything but a good condition; and these products could only be disposed of at a serious loss. The breeze was utilized, as usual, in the manufacture of compressed fuel, which is employed to heat the retorts. Practically all the ashes produced on the works are sold for making mortar and repairing the roads. The manufacturing capacity of the works was increased last year by bringing into use the second bench of inclined retorts in the new station, thereby raising the productive capacity to 50,000 cubic metres, or rather more than 1⅞ million cubic feet, per day. The total amount of capital employed in the undertaking at the close of the year was 29,768,997 frs. (£1,190,760), against 28,628,611 frs. (£1,145,144) on Dec. 31, 1901.

With regard to distribution, the mains were extended by 1346 metres (1480 yards); bringing up the total length to 186,424 metres (205,065 yards). The number of meters in use on Dec. 31 was 33,789, or 1766 more than at the corresponding date in 1901. There were 382 prepayment meters fixed; bringing up the total to 3638. The rising mains were increased by 480; making the entire number in use at the end of the year 5060. Of interior installations, 1347 were fitted up; so that there are now 12,876 in use in the city. The gas-stoves on hire number 25,030, against 23,390; and the gas-engines, 394, compared with 362—representing 4160½-horse power against 3821-horse power. Outside lanterns are let to private consumers, and 148 had been placed at the close of the year. For the public lighting, 6619 lanterns are employed, and the whole of the ordinary jets have been displaced by Auer burners. The total number of lighting hours last year was 3856; and 648 lights were extinguished after midnight.

WELSBACH INCANDESCENT GASLIGHT COMPANY.

Annual Meeting—Reorganization of Capital Scheme Approved.

Notwithstanding the early hour for which the Annual General Meeting of the Welsbach Company was called yesterday morning—11.30—the attendance of proprietors was large; but there was nothing like the excitement prior to the commencement of the proceedings such as marked the assemblies held the early part of last year, when the old Directors were dislodged from office, the Advisory Committee took over the command of the business, and subsequently were superseded (though continuing in constant conference) by a new Board. Yesterday's meeting was held in the Great Hall at Winchester House; and the change from Cannon Street Hotel—the scene of the confirmation of the remarkable financial flights of the Company which have ended, as was inevitable, in an equally and necessarily remarkable reorganization—helped to emphasize the great change that has taken place in the management of the Company's affairs.

The Chairman, on rising to commence the business, was very heartily received. His opening speech throughout was to the point. Dealing with the report and accounts, which gave the results of the first year's working of the new administration, he said there was one matter on which there was singular unanimity between the past and the present Directors, and that was the absolute necessity for the establishment of a sound commercial policy, free from patent protection or monopoly. There had, however, been in the past a singular failure to grasp the rudimentary steps necessary for the establishment of this policy. It had therefore devolved upon the present Board, in reorganizing the business, to undertake this very onerous, and at times very disagreeable, task. The result had been that they had been able to convert what was a growing loss on the English business into a profit of £51,908, or deducting debenture interest, of £45,858. For purposes of comparison with the figures of former years, it would be necessary to add the amount of the Austrian dividend which was not included in the accounts now presented. Last year this dividend amounted to £47,558; and there was every reason to believe, from the advice the Board had received since the issue of their report, that the amount this year would be about £36,000. The Austrian dividend had fallen from 100 per cent. in 1898 to what would probably be 30 per cent. for the past year; and he was sorry he could not say he thought it had reached low-water mark yet. Their Austrian Manager advised them that, in consequence of the expiration of the Austrian patent, he had had to reduce his prices, and he did not consider that he would be able to maintain this profit for the coming year. He (the Chairman) maintained that the accounts now presented showed the soundness of the Board's policy of reduction of prices and the maintenance of the quality of the mantle. They must maintain the quality of the Welsbach mantle at all hazards; and on this point he did not think he could do better than quote their General Manager's words, that "quality was, and ever would be, the Welsbach watchword." The mantle trade continued to show steady progress; and the sales last year were in excess of the sales of any previous year in the history of the Company. He believed he was right in saying that their mantle output was now the largest in the world. But it was necessary, if they were to maintain their position, that they must be able to take advantage of any improved method which might be brought forward for economizing the labour in manufacture, or for producing a better mantle than the one they were now turning out. In their report, the Directors referred to the acquisition of a system which would enable them to produce a mantle of even better quality in the coming year than they had had hitherto. One weak point in the Welsbach mantle, and of all incandescent gas lighting generally from the beginning, had been the fragility of the mantle, and its short life. By the help of the new mantle, these difficulties would be greatly overcome. It would be a mantle of great durability, longer life, and increased illuminating power. It might be that, with the issue of this mantle, there would be a decrease in the sales; because, if the consumers got a mantle that would last longer, they would, it naturally followed, not require so many in the year. But if he knew anything of the British public, they would support the production of the best article in the market. There was no doubt that the maintenance of the quality of their mantles helped their other products. The mantle was their sheet-anchor; but their burners also formed an important part of the business. The sales of the Kern burner continued to exhibit a steady and satisfactory increase. Every Welsbach and every Kern burner, before being issued, was tested to a point to give the maximum of light with the minimum of gas consumption; and this largely accounted for the steady increase in the sales of these articles. During the coming year it was intended to introduce the Kern cooker. It was too early to say what the result of this would be; but, like the other productions of the Company, he believed this would be an extremely good one. He next dealt with a point which had been one of immense difficulty for the management to grapple with—that was, the question of frauds. They had suffered greatly from this fraudulent institution—the copying of their labels, and the copying of their boxes. They had convicted one vendor of this; and since the issue of the report there had been two other cases, which were even worse. In these, not only had their boxes been imitated, and the Welsbach label copied, but the mantle enclosed in the boxes was an inferior make (presumably a foreign production), stamped with the Welsbach trade mark of "A U R." In both these cases, they had obtained a conviction; and there was no doubt that some of the complaints as to the quality of the Welsbach mantle in the Liverpool district were due to these frauds. The will-o'-th'-wisp infringers of the past (which the Company were unable to suppress formerly) had to an extent become the fraudulent imitators of to-day. There was another side to this question. It was fair to conclude that the public must want more Welsbach mantles. They were tired of the inferior article; otherwise men would not take such risks as these. He thought it was also evident—in view of the Company's increasing sales, and in view of the great competition of the past year—that the Welsbach position could never be successfully assailed by cheap and nasty imitations made in Germany. [Turning to the accounts the Chairman commented on several items—only a few of which we can notice here.] Regarding the item in the balance-sheet "suspense account £11,893," he explained that this was the balance of the £20,000 which the Board thought it necessary to reserve last year in view of possible losses that might arise out of the contracts entered into in the past. It was still necessary to hold this balance, as, he greatly regretted to say, the Board had not liquidated all the responsibilities that they took over. Sundry creditors appeared at £48,341, which was £12,000 less than the total amount of last year. In commenting upon this item last year, he said the proprietors would probably see it reduced, as the Board had commenced the system of paying cash for all their purchases, wherever they could get an adequate discount. The major part of the £48,000 represented their indebtedness to the Austrian Company for fluid supplied during the past year; and it had always been the custom to deduct this amount from the dividend receivable from the Austrian Company. However, the result was that, in increased discounts during the year, in consequence of this new system, they had made £1750 more than last year—this was not a large sum perhaps; but it was the aggregation of such sums by economical working that enabled an industrial Company to pay a dividend to its shareholders. On the other side of the balance-sheet, it would be seen they had bought during the past year, in small lots at various times, fourteen further shares in the Austrian Company, at an average of a little over £155. This would give the proprietors some idea as to the great depreciation in this item of their assets. Since the issue of the report, they had bought eleven more shares at a slightly lower price. The expenditure since April 1, 1897, on leaseholds, plant, &c., including the new factory at Wandsworth, amounted to £32,698, as per the last balance-sheet. Since then, the expenditure had been £17,061—making together £49,755, from which the Directors had in the past year written off £5908. This depreciation included depreciation on leaseholds, on such a basis that, at their expiration, they would be entirely written off the books. The sundry debtors amounted to £47,175, which compared with £63,186 last year, and £70,962 in the previous year. This was also evidence of better management. The stock-in-trade stood at £61,267, as against £75,144 last year, and £117,216 in the previous year, which was still further evidence of good management. He thought perhaps in the £61,000 they had still a larger stock than was necessary to carry on the business; but the stock had been made so large owing to the optimistic ideas that prevailed in former years as to the quantity of stock required. The total of cash in investments was £167,414, which compared with £73,648 last year, and £14,621 the year before. The net result was that during last year they had increased the cash by £93,766, and reduced their liabilities by £12,000. There was only one matter of regret in connection with the improved position—and it was sincere regret—that the Board were not able to recommend the distribution of a dividend. Commenting on the profit and loss account, the Chairman showed that salaries, wages, travelling, office, and miscellaneous expenses (including rents, rates, taxes, and insurance) had been reduced by almost exactly one-half—from £58,503 to £29,179. The Company had been charged with cutting off all outside revenue, and confining themselves solely to the manufacture of mantles. He thought that the proprietors would have seen the absurdity of this. What had been done was to cut off the retail branches, where they had been losing £10,000 to £15,000 a year, and causing a great deal of irritation in the trade. They had also closed the Earlsfield works and closed the Kern Burner Company, and the losses that were occurring in connection with them. He did not call this cutting off sources of revenue. But he thought it might be called consolidating the business, and carrying it on on sound principles. He moved the adoption of the report.

The report having been seconded by the Vice-Chairman (Mr. W. W. Mattinson, K.C.), Mr. Lock congratulated the Board on the way they had directed the Company and the results achieved. There was one point, however, with which he did not agree, and that was, notwithstanding what was stated by the Chairman and in the report, he was advised that mere depreciation would not prevent the distribution of profits, which had been legitimately earned by the trading of the year, on the preference shares. He suggested that what should be done would be for the Board to recommend the payment of a dividend to the preference holders, and, if necessary, let the matter be fought out in a friendly way in High Court. It was pointed out by Mr. Fred Walker that the decision in connection with this matter was founded on the well-known case of *Bond v. Barrow Hematite Company*, which had not been appealed against. In his opinion, the Company had already had too much law, and he was supported in this by other shareholders. Mr. J. B. Hurst, however, was in favour of getting up a little friendly action on the matter. The Deputy-Chairman read the "unequivocal and conclusive opinion" of Mr. Palmer on the point, which stated that, in view of the position of the Company, the Directors would incur serious personal liability if they recommended, or took part in, the payment of a dividend. He (Mr. Mattinson) asked the shareholders not to embarrass a situation which was already sufficiently embarrassing. Among other shareholders who spoke was Mr. Lea-Smith, who advised the support of the Board, and Colonel Mundy, who asked one or two questions, to which the Chairman replied as follows: First, that although the sales of the Kern burner showed a satisfactory increase, he (the Chairman) was of the same opinion that he had always held, that there was nothing in the burner to justify such a huge purchase price as £80,000. Second, as to the policy of buying further Austrian shares, when the Company was originally formed, capital was reserved for the acquisition of the entire number of these shares. The idea of the Directors was that it would be wise for the Company to buy the balance of the shares, and own the whole Company. The motion was carried, with only four dissentients.

The Chairman was re-elected to his seat at the Board by a most enthusiastic vote. Subsequently the Auditors were re-appointed.

The succeeding business was the consideration of the resolution—"That the Board be authorized to take all the steps in their judgment necessary to secure the separation of the 'A' and 'B' undertakings of the Austrian Company, and to restore the control of the 'A' (gas) undertaking to the 'A' shareholders." The connection of the Welsbach Company with the Austrian Company is far too complicated a matter to explain in the little space at disposal here; but next week

we will give some extracts from a long statement on the subject which was read by the Secretary, and which disclosed a very peculiar tale of improvident speculation and delusion. A protest against some of the statements made in the Directors' published statement was read from the Solicitor to Baron Welsbach. The resolution was moved by the Chairman, and seconded by the Vice-Chairman, who were supported by Mr. Samson, who, it may be remembered, retired from the old Board some two years ago, because he could not tolerate the arrangements made with Dr. Auer. The motion was carried.

Coming to the question of the reorganization of the capital, it is unnecessary to say more than a few words—the whole position and proposals having been so clearly stated in the Directors' recently issued circulars (*ante*, p. 241). The Chairman moved: "That in the opinion of this meeting it is desirable to effect a reduction in the capital of the Company on the general lines of the scheme submitted." He remarked that, in the writing down of the capital, the smallness of the assets had to be taken into account—£450,000; and, to make up the total capital recommended, they had to add a sum of about £900,000, or more than ten years' purchase of the profits at the present time, as goodwill. There were two important items of loss to be faced: The depreciation in the value of the Austrian shares, and the item of "patents," which to-day stood in the books at 1¾ millions. The principal patent was that of 1893, which had now only a short time to run. If they valued this at even £300,000, they would require to write off from it during the next three years quite one-half, and then, at the end of the three years, they would have to transfer the balance of £150,000 to goodwill. It was far better to write off this patent, and add a sum in respect of it to goodwill. The goodwill of the business was a valuable one; and they had taken the possibility of improvement fully into consideration. This question of the reorganization of the capital so far as the proprietors were concerned was rather one of proportions than of amount. The proportions had been taken very carefully into consideration; and he thought the whole of the proprietors were being dealt with very justly. There was one addition to their suggestions; and that was that there should be no profits in any future year devoted to the redemption of debentures until the ordinary shareholders had received 5 per cent. dividend. The resolution to be passed that day was not an effective one; and there would have to be class meetings of the proprietors later on. Answering a question, the Chairman added that the proxies received in favour of their propositions represented £722,809 of stock. The Hon. Phillip Stanhope seconded the motion. Mr. Blount, Mr. Lock, and Mr. Hurst, were all rather impatiently heard in their criticisms of the proposed treatment of the preference proprietors; and then the motion was put. Amid great cheering, it was declared carried with only half-a-dozen votes in opposition. Once more there was a hearty cheer raised for the Chairman and Directors; and the proprietors dispersed.

GAS-WORKS EXTENSIONS AT SALTLEY, BIRMINGHAM.

Some interesting figures with regard to the working of the Birmingham Gas Department were given by the Town Clerk (Mr. E. O. Smith), in the course of a Local Government Board inquiry held last Friday relative to an application by the Corporation for sanction to borrow £200,000 for the purpose of extending the Saltley Gas-Works. In explaining the need for the money to the Inspector (Mr. H. P. Boulnois), the Town Clerk remarked that the sum they desired to borrow was a large one, but so was the undertaking. In 1876, when the Corporation secured the concern, the capital stood at £2,112,686. At the present time it was £2,800,193, or an increase of about 32 per cent. Against this, there had been accumulated a sinking fund of £642,868, which nearly extinguished the increase of capital. The actual debt was therefore £2,157,325 (taking into account the sinking fund), so that the increase in the amount of the debt since 1876 was only £44,639. In 1876, the quantity of gas manufactured was 2650 million cubic feet; and in 1902, with practically the same capital employed, they manufactured 6315 million cubic feet—an increase of 3666 million feet, or 138 per cent. The price paid for gas in 1876 was 2s. 10·6d. per 1000 cubic feet, and in 1902 it was 2s. 3·84d. Between 1876 and 1902 the net profits, after payment of interest charges, amounted to a total of £1,009,661; and of this £709,562 had been actually handed over in relief of the rates, and the balance of £300,099 had been applied to the creation of a special fund in excess of the statutory requirements, for the erection of offices, &c. These figures, however, did not entirely represent the benefit derived by the ratepayers. The rates had been further relieved to the extent of £252,257 by reduced charges made for gas for public lighting, both inside and outside the city. It was proposed to erect the new works on freehold land belonging to the Corporation—land specially allocated for gas-works purposes by Parliament. The division of the amount asked for was, roughly, £166,000 for works and £35,000 for prepayment meters. The Chairman of the Gas Committee (Mr. Bishop) stated that they could not possibly fulfil their statutory obligations unless the contemplated extensions were carried out. The Secretary to the Gas Department (Mr. J. Hampton Barber), in reply to the Inspector, said that the maximum capacity of the works was 39¾ million cubic feet per day, and the maximum actual output in 24 hours during 1901-2 was 32,910,000 cubic feet, though in the year before that they had a maximum output of slightly over 33 million cubic feet in 24 hours. In 1901-2, they estimated that the output would be 6316 million cubic feet, and it was actually 6315 millions. In 1905-6, they estimated that the output would be 7532 million feet; and the Engineer was of opinion that it would then be necessary to have the further works in respect of which the loan was asked, and which would increase the capacity by 5 million cubic feet per day. The Engineer (Mr. Henry Hack) then explained the details of the scheme. At the close of the inquiry, the Inspector remarked that he was very much struck with the fact that the Gas Department was doing such an enormously increased business with very nearly the same amount of capital with which it started; and he said that if all municipal trading was conducted on these lines, there would be nothing to complain of.

LONDON COUNTY COUNCIL AND GAS-TESTING.

The Bills in Parliament.

At to-day's Meeting of the London County Council, the following report of the Parliamentary Committee will be submitted.

In further reference to our report, which was before the Council on March 10, we now have to inform the Council that we understand the Board of Trade have decided to appoint a Departmental Committee to consider various questions relating to the supply of gas in the Metropolis.

On the date above-mentioned, the Council approved our action in asking the President of the Board of Trade to appoint a Departmental Committee to consider the question; and in pursuance of directions given by us from time to time, communications with the Board of Trade of a more or less informal character took place, and officers of the Council attended a conference held on April 22 at the Board of Trade offices, at which representatives of the three large London Gas Companies and of the City Corporation attended.

Mr. Bonar Law, Parliamentary Secretary to the Board of Trade, presided over this conference, and stated that, in view of the fact that the Board of Trade had no jurisdiction so far as concerns the questions arising on the Crystal Palace District Gas Bill, and in regard to which the Council is taking action, this Bill would not come within the scope of any inquiry to be undertaken by the Board.

At this conference, it was announced that the Board of Trade would appoint a Departmental Committee; and it was suggested that clause 54 of the London County Council (General Powers) Bill, which seeks to repeal section 6 (relating to gas-testing) in the South Metropolitan Gas Act, 1900, should be withdrawn, and that the Commercial Gas Bill, which is promoted merely with the object of seeking for the Company a method of testing similar to that provided by section 6 of the South Metropolitan Gas Act above referred to, should be allowed to proceed as a temporary measure limited to three years only, with the preamble amended to state that it was only passed to deal with the matter pending, and without prejudice to any report of a Departmental Committee, and that the passing of the Act should not be deemed to in any way prejudice the Council, nor be construed as implying any acquiescence on the part of the Council in the desirability of the provisions of the Bill.

We considered these conclusions satisfactory, and accordingly gave directions for the clause in question to be withdrawn from the General Powers Bill, and we have arranged with the promoters to amend the Commercial Bill on the lines indicated. The Crystal Palace District Gas Bill we shall oppose before a Select Committee of Parliament. We recommend that the course taken be approved.

THE STOURBRIDGE GAS MANAGERSHIP.

At their Meeting on Monday of last week, the Stourbridge Urban District Council went into Committee to discuss the subject of Mr. William North, their Gas Engineer and Manager, who had previously expressed his intention of retiring at the expiration of his term of agreement in June next. On the resumption of the Council meeting, the members confirmed the business transacted in Committee—viz., that the salary of Mr. North be raised £50 per annum at the expiration of his term in June, and that six months' notice be given on either side to terminate the new agreement. This was carried by 17 votes to 2; 3 being neutral. It was explained that the Chairman of the Council and the Chairman of the Gas Committee had interviewed Mr. North and had gained his consent to remain in the service of the Council for some time longer. Commenting on the matter, the Worcestershire and Staffordshire "County Express" says: "The thanks of the ratepayers are due to Mr. Isaac Nash and the Chairman of the Gas Committee (Mr. Purkis) for the manner in which they were able, at the last moment, to step in and induce Mr. North to change his determination to sever his connection with the town at the expiration of his agreement as Gas Engineer and Manager in June next. The result of their negotiations was cordially approved by the Council on Monday; and the result is that Mr. North continues in his position, at an advance of salary of £50 per year. Considering that the Manager has not received any advance for ten years, and that during that period the make of gas and the business done has doubled, no one is likely to charge the Council with extravagance. While referring to gas managers, the public will learn with interest that the net trading profit made by the gas undertaking for the year ended March last amounted to the handsome sum of £9400. After paying off £7300 in repayment of capital and interest, there will be a disposable balance of over £2000. It will be remembered that some time ago the Council passed a resolution by which it was decided that half of the profits accruing from the undertaking should be directly allocated to the reduction of the rates. This means that for the current year the ratepayers will receive a free gift of £1000, while the Gas Committee will have a similar sum in hand for disposal in other ways." This is not the only appreciative reference to Mr. North which appears in the paper, for we notice also a letter written by Mr. Walter Jones, of Stourbridge, in the course of which he remarks that the Council have done a graceful act in retaining Mr. North's services, and one that will be highly appreciated by the majority of the ratepayers. "To speak of his special abilities as Engineer and Manager, or of his integrity, through the medium of a public paper would," he says, "be waste of time, as everybody in Stourbridge, and very many outside, are as familiar with his character as they are with his courteous and amiable disposition. Stourbridge has been especially favoured for many years in having such a Gas Manager; and the Council are to be congratulated upon their wisdom in retaining his services. I am not alone in the desire to pay a public tribute to Mr. North's worth, and to express appreciation of the action of the Chairman of the Council in smoothing away the difficulties which threatened to rob the town of so valuable a public servant."

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Thursday, at the London Offices, No. 1, East India Avenue, E.C.—Mr. F. J. HESELTINE in the chair.

The SECRETARY (Mr. J. M. Macmorran) having read the notice convening the meeting, the Directors' report and the accounts were taken as read.

The CHAIRMAN said it was a great pleasure to meet the shareholders with such a satisfactory balance-sheet, showing the prosperous condition of their property; for, although the stagnation of business in Buenos Ayres continued through the whole of the year under review, and seriously affected the income of many of the Company's customers, the profit was 15 per cent. greater than that of the preceding year. This profit, which amounted to £60,053, was arrived at after deducting £17,340 spent in the upkeep of the works and mains, as well as all charges for management both in London and Buenos Ayres, and after writing off bad and providing for doubtful debts and the payment of taxes, which latter amounted to £10,904. To the £60,053 had to be added the £7869 brought forward from the previous year, making a total of £67,923, which the Directors proposed to deal with as follows: To pay a balance dividend of 8s. per share, which (together with the interim dividend) made 7 per cent. for the year, free of income-tax; to place £10,000 to reserve, bringing it and the contingency fund up to £73,295; to write £2112 off discount and expenses *re* issue of debenture stock; and to carry forward £10,811 to the current year's accounts. Now although this result was sufficient to enable the Directors to recommend the payment of a higher dividend, if so inclined, they were unanimously of opinion that it would be impolitic to do so, in face of the competition of the electric light. Although the competition had not prevented the Company showing considerable progress in their business, the Directors felt that the prudent course for the shareholders was to content themselves with a dividend at the same rate as that of last year (which he ventured to think could not but be considered a liberal one), to build up the reserves, and to so strengthen the Company's financial position as to be able to meet any eventuality that might arise. It would no doubt interest the shareholders to know what might be considered the chief causes that had contributed to this satisfactory result. He (the Chairman) thought they might be summarized as follows: To the good quality of the supplies of coal, &c., sent out, and the very favourable prices at which the Board were able to secure them; to economies effected in wages through improvements in carbonization; to better carbonizing results; to an increase in the sale of gas; to a higher value of the paper dollar in which business was conducted; and last, though by no means least, to the loyalty of the Local Committee, and to the intelligence and activity of their Manager (Signor M. Obarrio) in Buenos Ayres, aided by a competent and zealous staff both at home and abroad. He need scarcely say that the same care and attention had been exercised in regard to the supplies the Board were sending out for the present year's consumption, which they had been fortunate in securing at even better prices than those already referred to. Therefore there was every reason to suppose that 1903 would prove quite as successful as the year now under review, especially as the commercial depression which had been hanging over the country had now happily passed away, and there was distinct evidence that a period of great prosperity had been entered upon. In addition to the private customers, the Company had considerable transactions with the Municipality, for whom they lighted between 6000 and 7000 public lamps. It was therefore with great satisfaction the Board learnt that the Company's relations with that body continued to be most cordial and that their business with them had a particularly favourable outlook. The economy and control which the authorities had lately exercised in their administration had so improved the municipal finances that, since the accounts were made up, the whole of the indebtedness that stood against them for public lighting at the end of the year had been paid off. In their efforts to effect still further economies in the manufacturing department, the Directors a short time since summoned home the Manager of the technical department of the Company's works; and he, with their indefatigable Secretary, had visited several of the most important and up-to-date gas-works in England and Scotland, in order that they might have the opportunity of seeing in actual operation the different methods of carbonization and illumination that had been found the most successful here. Very valuable information was gained during this tour; for the Managers of the different works visited, having the same end in view, willingly assisted in the Directors' object, by fully explaining the advantages they had secured by the adoption of certain improvements. The Board felt that a far more practical and inexpensive way of gaining their end was for their Technical Manager to see in operation "proved" methods and their results, rather than for the Company to rush into costly experiments. The Directors had every reason to believe that this visit would tend still further to reduce expenses, which had lately been brought down in a very marked degree; and it was to this they attributed a large share of the gratifying result placed before the shareholders that day. Successful, however, as they had been in this direction, it was hoped to still further improve their position; and for this purpose the Board were sending out Mr. Macmorran at the beginning of next month to discuss with the Committee and Managers on the spot such subjects as would tend to this end. They had also had the advantage of an interchange of views with Mr. John Gibson, one of the members of the local Committee, who was at present on a visit to England, and who gave a most satisfactory account of the condition of the Company's property, and of the success attending the use of incandescent mantles and the introduction of cooking and heating stoves. As would be seen by the report, the net gain in private meters fixed was 881, although only £57 was spent in extending the mains; thus showing an increased consumption of gas per mile of main. He (the Chairman) was glad to tell the shareholders that the bad debts showed a reduction; but he was sorry to say it was an unfavourable year for the sale of residuals, owing to the drop in the price of coal locally, and the importation of a large stock of English coke induced by the prices they had previously obtained for this commodity. This caused a rather serious accumulation of coke at the works of all the Gas Companies; but by a reduction in its price in October, the sale greatly improved, and enabled them to close the year with a stock of no great importance. Referring to the balance-sheet, he said the capital and debenture stock remained unaltered, and were of very modest amounts—viz., £500,000 shares, and £250,000 4 per cent. debenture stock. The reserve was increased this year by £10,000, raising it to £60,000, and the contingency fund was £13,295—thus bringing these two amounts up to £73,295. The new public lamp redemption fund, which figured for £176, was created to meet the terms of the new contract with the Municipality for lighting by incandescent burners. On the credit side of the account, it would be observed that £268 only was spent on capital account in additions and extensions, and £7650 for public lamps, new meters, and services in use and in stock. A further £2112 had been written off discount and expenses *re* issue of debenture stock. He might explain how this debt was incurred, why its extinction was charged over a series of years, and the benefit derived by the shareholders by the issue of 4 per cent. debenture stock and the cancellation of the 6 per cent. debentures that existed before this issue was made. The 6 per cent. debentures fell due, and were extinguished by this issue at the end of 1897. The annual interest on the debentures then amounted to £12,000; while on the 4 per cent. debenture stock it now amounted to £8800. Thus the revenue was immediately relieved of an annual charge of £3200; and as this stock was not repayable for 28 years, the total saving to the shareholders by the conversion, after deducting the whole of the expenses, was £70,694. Instead therefore of writing these expenses off revenue in one year, it was decided to extinguish the debt over a series of years. This was being done; and in five years the whole amount would be paid off. There was one other subject to which he wished to call attention, and that was the paragraph the Auditors had thought fit to insert in their certificate as to depreciation—"that no depreciation has been charged against the profits of the year beyond the actual expenditure for repairs and maintenance." This matter was fully explained to the shareholders at their previous meeting; and it remained for them to say if they thought it desirable that this repetition should continue, when it was borne in mind that ample provision in the opinion of the Board was made each year out of revenue to keep the works in a thoroughly efficient condition, and that a further charge for depreciation would be unnecessary and exceptional. He moved the adoption of the report and the declaration of the dividend already mentioned.

Mr. F. C. IM THURN seconded the motion.

Mr. J. N. LAWRENCE asked whether the Directors were not writing off anything year to year in the way of depreciation.

Mr. SAMUEL SPENCER expressed his satisfaction with the good record the Directors had put before the shareholders. It was, he added, an entirely new thing for such a reference to depreciation as the one referred to by the Chairman to appear in the Auditors' certificate to a gas company's accounts; and, after what was said at the last meeting, he should have thought the Auditors would have seen the force of leaving it out. Seeing that the Directors kept the works up to "concert pitch" as it were, they spent a great deal more on them than would be the case if they merely set aside a depreciation fund. A depreciation fund sometimes ran only to 1 per cent.; but the Directors expended a great deal more than that on the works, besides transferring £10,000 to a reserve fund. He thought the Auditors' reference ought to be deleted. He also asked if the Directors were making favourable coal contracts now. His experience was that the present was a very good time indeed to enter into contracts; and the longer they could be made the better. The 15 per cent. extra profit showed the excellent working of the staff.

The CHAIRMAN, replying to Mr. Lawrence, said the point depended entirely on what he called "depreciation;" and if he (the Chairman) told him what had been charged in the last two or three years to revenue account, perhaps he would better understand the position. Some time ago it was determined to put up a Peebles oil-gas plant. This, he assumed, would be considered a capital charge; but it was charged to revenue. Next they put up a large and valuable water-gas plant. That was also a capital charge; but it was charged to revenue. Then they had a gasholder that did not give them satisfaction; and they determined to put up a new one. This had also been charged to revenue. He did not think he could give a better answer to the question.

Mr. LAWRENCE also asked if the whole of the coal gas was produced in inclined retorts.

The CHAIRMAN replied that it was. As to the coal contracts, he thought Mr. Spencer could not have caught what was said in his opening speech—that the Directors had contracted for all their supplies for the coming year at much lower prices than last year, both for supplies and freight.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. ROBERT NESHAM, Mr. F. C. im Thurn was re-elected to the Board; and Mr. Ross Pinsent was also returned, on the motion of Mr. J. C. IM THURN, seconded by the CHAIRMAN.

Proposed by Mr. SPENCER, and seconded by Mr. U. T. WILKINS, the Auditors (Messrs. Turquand, Youngs, and Co.) were re-appointed to office.

Mr. JOHN GIBSON, the member of the Local Committee to whom the Chairman had referred in his speech, then gave the shareholders some interesting information as to the present position and prospects of Buenos Ayres and the country generally.

The Local Committee, Managers, and staffs both in Buenos Ayres and London were cordially thanked for their loyal services; and subsequently a similar compliment was paid to the Chairman and Directors.

Messrs. Meldrum Bros., Limited, who have for the past twelve years carried on business at the Atlantic Works, City Road, Manchester, have now removed to large, well-equipped, and conveniently situated works at Timperley, near Manchester.

POLYTECHNIC EXAMINATIONS IN GAS MANUFACTURE.

We have received from Mr. Walter Grafton, F.C.S., the results of the Polytechnic Examinations in Gas Manufacture which took place on the 22nd ult. In the honours grade, Mr. F. S. Larkin won the first prize (a silver medal), Mr. R. W. Hunter the second, and Mr. H. M. Royle the third; while the first prize (a bronze medal) in the ordinary grade fell to Mr. R. H. Chree, the second to Mr. W. E. Dean, and the third to Mr. R. L. Fenner. The following were the questions put.

Honours grade: (1) State fully what means you would adopt to minimize the destructive action due to expansion caused by heat in a bench of retorts. (2) State the advantages and disadvantages of inclined *v.* horizontal settings of retorts, with carbonizing results per ton. (3) Give a sketch of a station governor, and clearly state in what way equilibrium is achieved. Is this essential, and why? (4) There are, of course, various sectional earths—some having little clay and much sand, others a fair proportion of each, in addition to chalk, rock, or loamy soil. State carefully the advantages or disadvantages in erecting a holder upon these sites, having regard to economy. (5) What explanation would you give to the fact that the flames of hydrogen and methane are almost non-luminous, while that of coal gas is highly so? How can light be obtained from the almost non-luminous flame of a mixture of air and coal gas? (6) Describe fully the process of purification by having four limes and two oxides for the complete removal of impurities. Would you expect to find any difficulties in this method of reducing the quality from 16 to 14 candles? (7) Describe the most efficient method of enriching poor coal gas to 14½ candles, having regard to lighting and heating value. Give four reasons, at least, in favour of your method.

Ordinary grade: (1) What is the most economical setting of retorts for a large works, having regard to the method of heating? Give a sketch of a bed of nine retorts with fittings. (2) What are the objects of condensing gas, and at what point in the process of manufacture is it effected? (3) How, or by what means, is the flow of gas and liquid regulated and separated as they flow from the retorts to the exhauster? (4) There are various ways of consuming gas for (*a*) lighting and (*b*) for heating purposes. Clearly state these, having regard to efficiency and economy. (5) How would you purify gas from sulphuretted hydrogen, and how may the presence of impurities in gas be detected? (6) Describe a tar-extractor and a washer, and what products are removed from the gas by each apparatus. (7) Describe the Gas Referees' test for illuminating power. Give sketches, in plan, of the apparatus.

Dunstable Gas and Water Company.—At the recent annual meeting of this Company, the Directors reported that the sum of £1114 was standing to the credit of the gas undertaking, and £910 to that of the water undertaking.

METROPOLITAN WATER BOARD.

Election of Chairman.

The Third Meeting of the Board was held on Thursday, at the offices of the Metropolitan Asylums Board, on the Thames Embankment. Sir J. T. Ritchie presided at the opening of the proceedings. The first business was the appointment of a Chairman of the Board; and, on the motion of Mr. H. Burt, seconded by Mr. D. J. Morgan, M.P., Mr. R. M. Beachcroft (London County Council) was unanimously elected to the office. Mr. Beachcroft then took the chair, and in thanking the members for the honour conferred on him, declared his intention of devoting the whole of his time to the business of the Board, with every desire to make its work a success. Mr. Burt was nominated for the office of Vice-Chairman; but it was decided to defer that appointment for the present. Some discussion took place as to the day and time of the meetings of the Board, and finally Friday, at 2.30, was fixed, on the casting vote of the Chairman. The Board referred to the General Purposes Committee a letter from the Clerk to the London County Council suggesting the desirability of keeping records of rainfall, and for this purpose the continuance by the Board of the arrangement which has subsisted between the London County Council and Mr. H. Sowerby Wallis, and which will terminate on June 24 next; also a communication from the Town Clerk of Finsbury, suggesting that minutes of proceedings of the Board should be sent to the authorities represented thereon. The Chairman reported that Mr. Henry Clarke had been elected Chairman of the General Purposes Committee; Mr. D. J. Morgan, M.P., of the Finance Committee; and Mr. H. P. Harris, of the Law and Parliamentary Committee. The Board, at its rising, adjourned until next Friday, when it will again meet at the offices of the Metropolitan Asylums Board.

DEVONPORT WATER ARBITRATION.

Monday, April 20.

(*Before Sir* FREDERICK BRAMWELL, F.R.S., *Umpire.*)

This arbitration, to determine the price to be paid by the Corporation of Devonport for the undertaking of the Devonport Water Company, was opened at the Westminster Palace Hotel to-day.

Mr. CHARLES HAWKSLEY was Arbitrator for the Company; Mr. G. H. HILL for the Corporation. Mr. BALFOUR BROWNE, K.C., Mr. DUKE, K.C., and Mr. CLAVELL SALTER appeared for the Company. The Hon. J. D. FITZGERALD, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. BODILLY represented the Corporation.

Mr. BALFOUR BROWNE, in opening the case, said the Devonport

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 278.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 13	6½	Bombay, Ltd. . . .	5⅞—6⅛	..	5 4 0
140,000	5	,,	6½	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Feb. 26	12	Brentford Consolidated	240—245	..	4 18 0
286,700	,,	,,	9	Do. New . . .	177—182	..	4 18 11
50,000	,,	,,	5	Do. 5 p.c. Pref. .	131—136	..	3 13 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	110—113	..	3 10 10
220,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	209—214	..	5 0 5
246,320	,,	,,	7½	Do. A. Ord. Stk. .	151—156	..	4 19 4
460,000	20	Mar. 31	10	British.	39—40	..	5 0 0
100,000	Stk.	Mar. 12	6	Bromley, 5 p.c. "A". .	118—123	..	4 17 7
165,700	,,	,,	4½	Do. 3½ p.c. "B". .	90—95	..	4 11 9
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	11¼—12	+⅜	5 16 8
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	Mar. 12	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54*	+½	5 11 1
1,375,000	Stk.	Feb. 26	5	Commercial 4 p.c. Stk.	104—107	..	4 13 5
503,750	,,	,,	4⅜	Do. 3½ p.c. ,,	99—102	..	4 13 2
407,812	,,	—	3	Do. 3 p.c. Deb. ,,	89—92	..	3 5 3
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	115—125	..	6 8 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Feb. 26	5⅛	Crystal Palace Ord. 5 p.c.	115—120	..	4 8 10
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
106,158	,,	Jan. 15	5	Do. 5 p.c. Deb. Stk.	137—140	..	3 11 5
486,090	10	Jan. 29	10½	European, Ltd. . . .	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13—14	..	5 12 6
15,243,200	Stk.	Feb. 12	4⅛	Gas- { 4 p.c. Ord. . .	83—85	..	5 3 6
2,600,000	,,	,,	3½	light { 3½ p.c. max. .	85—87	..	4 0 6
3,799,735	,,	,,	4	and { 4 p.c. Con. Pref.	107—110	+1	3 12 9
4,193,975	,,	Dec. 11	3	Coke { 3 p.c. Con. Deb.	88—90	..	3 6 8
252,500	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Oct. 30	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	Nov. 13	10	Imperial Continental .	203—206	−1	4 17 1
473,600	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	100—103	..	3 8 0
165,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
561,000	Stk.	Feb. 26	10	Liverpool United A .	218—220	−1	4 10 11
718,100	,,	,,	7	Do. do. B .	162—164	..	4 5 4
306,083	,,	Dec. 31	4	Do. do. Deb. Stk.	113—115	..	3 9 7
75,000	5	Dec. 11	5	Malta & Medn., Ltd. .	4⅜—5	..	5 0 0
560,000	100	April 1	5	Met. of { 5 p.c. Deb.	103—107	..	4 13 6
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 13	3½	Monte Video, Ltd. . .	10—11	+⅛	6 7 4
1,515,892	Stk.	Feb. 20	4½	Newc'tle & G'tesh d Con.	103½—104½	..	4 6 2
376,855	Stk.	Jan. 2	3½	Do. 3½ p.c. Deb.	97—98	..	3 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd. . . .	143—148	..	5 8 1
600,000	5	Mar. 31	7	Ottoman, Ltd. . . .	6—7	..	5 0 0
105,005	Stk.	Jan. 15	6⅜	Ply'mth & St'house 5 p.c	127—132	..	4 12 9
851,070	10	April 30	7	River Plate Ord. . .	11½—12*	+½	5 16 8
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb..	94—96	..	4 3 4
250,000	10	April 17	8	San Paulo, Ltd.. . .	12—13	..	6 3 1
135,000	Stk.	Mar. 12	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	237—240	..	4 3 4
523,498	,,	,,	10	Do. C	237—239	..	4 3 8
103,235	Stk.	Mar. 31	5	Shrewsbury Ord. 5 p.c.	111—114	..	4 7 9
6,000,000	Stk.	Feb. 12	5⅜	South Met., 4 p.c. Ord.	118—121	+1	4 8 2
1,780,000	,,	Jan. 15	3	Do. 3 p.c. Deb. . .	90—92	..	3 5 3
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	105—110	..	4 10 11
87,950	,,	Jan. 15	4	Do. 4 p.c. Deb.	103—106	+3	3 15 6
120,000	Stk.	Feb. 26	6	Tottenham { A. 5 p.c.	117—122	..	4 13 4
300,520	,,	,,	4½	and { B. 3½ p.c.	56—99	+3	4 10 11
182,380	10	Dec. 30	8	Edmonton			
149,000	10	Jan. 2	5	Tuscan, Ltd.. . . .	8½—9½	..	8 8 6
730,872	Stk.	Mar. 12	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
				West Ham, 5 p.c. Ord.	95—100	..	5 0 0
				WATER COMPANIES.			
780,662	Stk.	Dec. 30	11½	Chelsea, Ord. . .	315—325	..	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref. .	145—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	130—140	..	3 4 4
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb. .	137—142	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.. .	235—240	..	3 6 8
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb. .	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	96—98	..	3 1 3
700,000	50	Dec. 11	8	Grand { 10 p.c. max..	123—128	..	3 2 6
310,000	Stk.	Mar. 31	4	Junction { 4 p.c. Deb..	123—128	..	3 2 6
708,000	Stk.	Feb. 26	10½	Kent	295—305	..	3 8 10
160,000	,,	,,	7	Do. New, 7 p.c. max..	195—205	..	3 8 4
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max..	305—315	+5	3 9 0
406,200	100	,,	8½	Do. 7½ p.c. max..	220—230	..	3 13 11
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb..	122—127	..	3 3 0
500,000	100	Feb. 12	12⅝	New River, New Shares	390—400	..	3 4 0
1,000,000	Stk.	Jan. 29	4	Do. 4 p.c. Deb..	123—128	..	3 2 6
902,300	Stk.	Dec. 11	7	South- { Ord. . . .	230—235	+2	2 13 7
126,500	100	,,	7	wark { 7½ p.c. max.	205—215	+5	3 5 1
489,200	Stk.	,,	5	and { 5 p.c. Pref.	150—153	..	3 5 4
1,019,585	,,	Mar. 31	4	Vauxhall { 4 p.c. A Deb.	122—127	..	3 3 0
1,155,066	Stk.	Dec. 11	10	West Middlesex. . .	295—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10

* Ex. div.

Water Company's undertaking was being purchased by the Corporation under an Act of last year. The Company resisted the passing of the Bill in both Houses; but Parliament had decided—unwisely, as he ventured to think, to put the concern in the hands of the Corporation. The accounts had been agreed between the Accountants of both parties to the purchase, and therefore only questions of principle would have to be settled between them. The Company originally obtained an Act to construct an open channel, not to exceed 10 feet wide, and they were authorized to take water from the Rivers Blackabrook, Cowsic, and West Dart; and to construct reservoirs, weirs, &c. Then the Act of 1876 showed that the capital of the Company was £50,000, with power to raise more. By that Act, the profits were limited to 7 per cent. on the ordinary stock, and 6 per cent. on the preference stock. Then a later Act restricted the profits to 5 per cent. By an Act passed in 1893, the limits of supply were extended to the Admiralty and others; and power was given to sell to East Stonehouse a part of the undertaking, and to provide cattle-places for Sir Massey Lopes. The property of the Company consisted of 4716 acres of drainage area; and the works were head weirs or in lakes by which the water was conveyed into the leat—an open channel—for 20 miles, and finally reached the Rowden reservoir in pipes. The source was 35 miles from Devonport. In many parts the leat was protected, and in some places it ran through cultivated land by trenches and culverts under it; so that there was no danger of pollution. The water was of first-rate quality; and the quantity the Company could get at their sources was greater than they could convey by the pipes to the district of supply. Owing to the cultivation of the land, and in some cases to the population coming nearer than was expedient, the Engineers thought that, as an extra precaution, further works should be carried out to make the water absolutely above suspicion. The Company intended to do this; but the Corporation opposed them, saying that only a small modification of the works was required to amply secure the shareholders their maximum dividends. The Company had £9000 a year to divide; but there were certain arrears of dividend which they would have to pay, and they had £11,000 in hand on revenue account, which they were entitled to distribute for this purpose. Further, their earning capacity was greatly in excess of the amount required to pay the maximum dividend. The annual income was £18,298, and the annual expenditure £5921; so that the net income was £12,377. This figure would have to be adjusted by a small sum of £26 per annum paid to a servant of the Company who was upwards of 70 years of age. Out of the £12,377 had to be taken the interest on debentures, £897, which left £11,480 applicable to the payment of the maximum dividend and arrears. The Company would first pay the former, and then use some of the remainder for paying the latter; and, when all these had been paid off, the balance was to be regarded as security. The maximum dividend the Company could pay was £9409. The first question to be determined was how the income was to be kept alive. As in other cases, Counsel started with the supposition that certain expenditure would have to be incurred immediately, in order to make the works absolutely perfect. They were excellent at present, and the Company could go on dividing the £9409, because they had £11,480 with which to do it; and it was perfectly secured, without spending a penny. When they had made allowances for the three bits of the leat which required protection, and the increased expenditure on the Crown Hill reservoir, the income was as well secured as Consols—in fact, a first-rate water company's income was better secured than Consols. Under these circumstances, the Company felt justified in applying to this £9409 a multiplier of 40 years, which, on the 2½ per cent. table, gave £376,378. He had exhausted a portion only of the £11,480 that the Company were earning, and therefore the balance (£2071) was applicable to the payment of arrears of dividend. After certain deductions, these came to £28,555; then 40 years' purchase of the dividends to £376,378; 1 per cent. on the preference stock to £12,451; and the small profit of about £166 on plumbing, which, capitalized at five years, worked out to £834—making a total claim of £418,218. But there were deductions to be made in order to render the works perfect, or that figure would be the amount he would claim should be paid. There were improvements in the leat which amounted to £37,517; the additional storage at Crown Hill would cost £30,000; and there was a sum of £207, the annuity of £26 to the servant—making a total of £67,724. This was deducted from the £418,218, which would give him (if he added nothing more to it), £350,494. He had something more to add. He had taken off £67,517 (leaving out the annuity) for defects. But as against those he had certain surplus works to show which he claimed as a set-off. The leat ran all the way down from Belliver into Devonport, and, for sanitary reasons, a pipe had been substituted for it, land having become very valuable; and they estimated it at £15,890. This sum he claimed as a set-off against the expenditure the Company would have to incur—viz., £67,724; that was to say, if they were continuing, and had to spend £67,724, they would have £15,890 as a set-off. Then there was a sum of £3092 awarded to the Company for part of the supply taken by the Plymouth Corporation; and it had been placed to a suspense account pending these proceedings. This £3092 either belonged to the shareholders, and was consequently outside this arbitration, or, if it was included, it became, like the £15,890, a deduction from the £67,724. He therefore claimed £18,982 as a deduction from the £67,724; or (which was the same thing) if he added the £18,982 to the £350,494, the total was £369,476.

The UMPIRE: Is that your total claim?

Mr. BALFOUR BROWNE said it was not. The Company did not intend to ask for the usual 10 per cent. allowance for compulsory purchase, though in most cases it was an absolutely right allowance; but they asked the Umpire to award, in addition to the £369,476, 1½ per cent. to cover the cost of delay in reinvestment, amounting to £5542. This made the total claim against the Corporation £375,018. This was absolutely secured by works that earned £11,480 per annum. Devonport was increasing in prosperity; and the quality of the water was not questioned.

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Evidence was then called in support of the Company's case.

Professor *Percy F. Frankland*, F.R.S., stated that the water flowing down a leat was better than that in a mountain stream, for it was carried above the level of the ground. The water had light and air in the course of its transit. The leat should be fenced to prevent cattle getting into the water; but this was only to meet a sentimental objection, for no harm would be done by the cattle.

In cross-examination, witness said he did not agree that the whole leat should be piped. It was more a matter of sentiment than of real protection to have a pipe—it was only an escape from a remote possibility.

Dr. *C. E. Bean*, Public Analyst for Plymouth and Devonport, said the quality of the water was uniformly good, and he never found any departure from this standard.

Mr. *W. Cash*, F.C.A., said the figures he had prepared for the purposes of the arbitration had been practically agreed with Messrs Alfred Lass, Wood, and Drew, who were engaged as Accountants for the Corporation. The only question was whether or not certain moneys were capital; and that was essentially a question of argument for Counsel.

Tuesday, April 21.

On the resumption of the proceedings to-day,

Mr. *H. Francis*, the Company's Engineer and Manager since 1878, said the population of their district was 67,000, and the number of premises supplied 8555. The demand for water had always been an increasing one. In 1897, the number of new supplies was 234, with a water-rate of £277 15s.; but 31 supplies had been discontinued—leaving a net increase of 203 supplies and £251 14s. In 1898, the net increase was 335 supplies and £430 11s.; in 1899, 447 supplies, and £632 16s. 6d.; in 1900, 372 supplies and £566 11s.; in 1901, 382 supplies and £586 10s. 4d.; and in 1902, 436 supplies and £660 4s. 4d. The assessments were still rising considerably; and the Company estimated that for the first quarter of 1903 they had 109 new supplies, with an additional revenue of £159 12s. 6d., which did not include meter services. This was at the rate of £638 a year. The town was growing, and the Admiralty were building blocks of barracks for sailors, and largely extending their Naval works outside the Dockyard. With regard to the volume of water, he might say that in the drought of 1899 they had an average of 1,940,000 gallons a day over a period of 111 days. This was the minimum of the 35 years' experience he had had of the Company's undertaking. By erecting proper storage reservoirs, the Company could command sufficient water from their existing watershed for the needs of Devonport for a very considerable time to come. The average daily consumption in 1902 was 2,337,792 gallons, of which 1,473,606 gallons were for domestic purposes and for supplies other than by meter—the latter numbering 864,000. This meant an average of 35·23 gallons per head per day.

Cross-examined by the Hon. J. D. FITZGERALD, witness admitted that the Company were bound to supply the Admiralty with as much water as could be carried through a certain 6-inch pipe, if the Admiralty chose to use it, at £425 per annum. But only about 72 million gallons per annum had been used, though about 175 to 200 millions could be carried through the pipe. He contended, however, that the proposed new barracks would not be served by this pipe.

Mr. FITZGERALD said he would not argue the matter with the witness, but it was a question of the construction of a section in the Company's Act.

Mr. BALFOUR BROWNE replied that in 1901 the Admiralty used 114 million gallons of water, for which they paid £2304; in 1902, 152 million gallons, and paid £2703. This disposed of the suggestion that the Admiralty could use as much water as they pleased for the £425. The figures he had given included meter-rents.

Mr. *Body*, of the firm of Messrs. Body and Son, Surveyors, of Plymouth, said he had purchased a great deal of property for the Plymouth Corporation for water-works purposes, and had a large experience in such matters. He had made a survey of the property of the Company; and he gave details as to its value.

Wednesday, April 22.

Mr. *Body* continued his evidence to-day as to the value of the portions of the Company's undertaking described as surplus land not actually used. He said that all land around Plymouth had been increasing in value for the past ten years. The surface value of the Company's offices (assuming that these were moved elsewhere) and the adjoining building sites was £1055; he valued the quay at Richmond Walk at £332; the disused leat at £5589; the disused reservoir at Outlands, £389; and surplus land at Crown Hill and Bellivor at £8525—making a total of £15,890.

Mr. *E. M. Eaton* said the high rainfall, the lofty elevation of the gathering-grounds, and the exceptional purity of the water, made the Company's undertaking a very valuable one. The dry-weather flow exceeded very largely the quantities generally obtained from gathering-grounds in the Midlands and the northern parts of England. Mr. Francis had only on two occasions found a flow of less than 2 million gallons per day. Therefore he considered that they had a minimum daily supply of this quantity, if there were no losses by leakage and evaporation. He would give some figures for 1902 (which was a moderately dry season, but not what would be considered a droughty one), and would then compare them with the exceptionally dry season of 1899. On July 29, 30, and 31, 1902, the consumption in the town and district was 7,469,904 gallons; for the whole of the month of August it was 70,483,000 gallons; and for 23 days in September it was 53,465,800 gallons—making a total of 131,418,704 gallons. In the corresponding periods of 1899, the figures were respectively 6,864,000, 63,286,500, and 47,234,700 gallons—making a total of 117,385,200 gallons. So that there was a difference between the two periods of 14,033,504 gallons. Their existing storage capacity was for 22¾

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millions; and taking all things into account, he considered they had a sufficient supply in case of accident to the leat. His net estimate of the value of the undertaking was £351,521 18s. 11d. But he had not taken into account the value of the surplus land; and because of this, there ought to be added the sum of £18,982, which had been estimated by the land valuers for the Company. Then he thought something should be added for loss by delay in re-investment, but he did not suggest that 10 per cent. should be allowed; he would ask for 1½ per cent.

In cross-examination by Mr. FITZGERALD, witness said he had valued the undertaking on the maximum dividend and the back dividends. He regarded the shares of the Company as being worth as much as Consols. Nothing short of a disruption of the British Empire would affect the security, unless, perhaps, there was an earthquake on Dartmoor. Devonport was extending rapidly, and the increase in the revenue of the Company in respect of the domestic supply was £600 a year.

Thursday, April 23.

Mr. *Francis* was recalled this morning, and handed in some additional plans and gaugings.

Mr. *J. Bulteel*, Chairman of the Company, said the latest preference stock of the undertaking was issued upon a prospectus, the last paragraph of which set forth that "should the profits of the Company at any time admit of a payment in excess of the maximum dividend on stocks already issued, the stock now offered will be entitled to an increased dividend of 5 per cent." In 1898, the Corporation made an offer to purchase the concern, but the Company declined to accept it.

Mr. *H. Rofe* said he had made a valuation of the Company's undertaking. So far as the works were concerned, he had regarded it as a prime factor in the case that there were at Lowery very valuable supplies of water, as shown by the gauge of Mr. Francis, and that by a proper pipe-track the Company could bring that supply complete to the reservoir at Bellivor. He had considered the proposed works, by which it was claimed that the supply could be brought on practically intact; and he agreed that this could be done. Those works would place the undertaking in the position that the income could be maintained in perpetuity, and therefore no greater security could be obtained. His mode of valuation was to ascertain what was the worth of the undertaking as a perfect security, making such deductions as were necessary to ensure its maintenance. His first figure showed the future maintainable profit of the undertaking upon the basis of the year 1902; and he had adjusted the income and the expenditure of that period in order to arrive at a normal year for a future upon that basis. He had therefore fixed £12,377 10s. 9d. as the income available to pay the maximum dividend, and he deducted from it the interest on debentures, £897 10s., which left a divisible profit of £11,480 0s. 9d. The debentures were repayable at short notice. Assuming the perfect undertaking, he proceeded to multiply the maximum dividend by 40 years, which, in his opinion, was the true multiplier. This multiplier would yield them a return of a Consols investment at par. It gave £376,378 6s. 8d. He added the back dividends, properly discounting them, £29,268 17s. 5d., and also the present value of the extra dividend on the preference capital, which he ascertained to be £12,785 12s. He made the whole capitalization to be £418,432 6s. 1d.; but, owing to this figure being arrived at on the basis of Consols, it must be regulated by their current price. It would be in the ratio of 100 to 91 or 91¼, or whatever might be their price. For a little plumbing business carried on by the Company, he added £815 15s. 5d.; making a grand total of £419,248 1s. 6d. Then there were certain works to be carried out in order to ensure the perfect security, and for these he made a deduction of £67,733 4s. 10d., bringing the figure down to £351,514 16s. 8d.; and some small percentage ought to be added for loss by delay in re-investment. This gave them a total of £356,787 11s. 2d. He thought the value of the surplus land (£18,982) should be added. His valuation was made jointly with Mr. Eaton.

This closed the case for the Company.

Mr. FITZGERALD then addressed the Umpire on behalf of the Corporation. He said that, owing to the way in which the claim had been put forward, it was necessary for him to say a few words as to the basis on which a statutory water company rested. The undertaking was incorporated by Parliament—their rights and duties were shown by their Acts. They had the right to supply water within their limits, and certain consequential rights with regard to the opening of roads. They had the right to charge the prescribed rates for the supply of water, and to pay maximum dividends, when they could earn them. After they had done this, and accumulated a reserve fund, which was merely a security for a dividend, all the excess profits were to go in the reduction of the price of water. Under no possible circumstances could the shareholders get anything in excess of their maximum dividends and the back dividends, if there were any. Under the Lands Clauses Consolidation Act, it was shown that the measure of compensation was the loss to the seller. This was what they were to be compensated for The only thing they were losing was their dividends and their back dividends; and in a case where a company were earning their maximum dividends, and these were well secured, and where they had a surplus revenue, those back dividends, if any, could be paid. When once they had capitalized their maximum dividends, and had ascertained the present value of those in arrear, they had given them everything it was possible for them legally to claim, because they had compensated them for everything they could have got if they had gone on in perpetuity. The attempt which was being made here, and which he had known to be made in only one other case, to get something in excess of the maximum dividends capitalized and the present value of the back dividends, was wholly wrong. It was claiming something to which they were not legally entitled; and it must of necessity fail. He considered that the surplus land and the plumbing business of the Company were as much a part of the undertaking as the supply of

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water, and therefore these ought not to be added to the capitalized figure of the maximum dividends. In the Company's Act, there was a section by which the Admiralty were entitled to as much water, if they chose to use it, as could be carried by a 6-inch pipe which ran to certain barracks, on the payment of a fixed sum. He argued that if the Admiralty erected additional barracks, they would be able to convey the water from the 6-inch pipe to the new barracks without extra payment.

Mr. DUKE disagreed with this construction being put upon the section.

Mr. FITZGERALD said that, in view of his friend not agreeing with this construction, and because he was so certain that his own was the correct one, he would ask the Umpire to have a case stated on this point for the opinion of the High Court. Counsel then proceeded to deal with the claims of landowners to rights of supply and that of the Plymouth Corporation to have concurrent rights of supplying water. These other matters he instanced as reducing the values of the undertaking. With regard to the 40 years' purchase, for the reasons he had given he did not think the undertaking was a "perfect" one, or anything like it, or that it had a large margin of security. On the contrary, it had hanging over it most undefined liabilities, the result of which in the future no one could foretell. But even if it were perfect, he submitted that to take 40 years' purchase would be extravagant in the extreme. He contended, with reference to the 1 per cent on the preference stock, that the share certificate showed 4 per cent, and nothing more. With regard to deduction on the valuations, he said the improvements which the Company considered necessary could not be carried out without an Act of Parliament; and if they were to take it that this expenditure was necessary to put the undertaking into perfect order, he contended that they must add the expense of getting the necessary powers, which would be considerable, to the sum to be deducted. He also declared that it would be necessary to cover the Rowden reservoir before the undertaking could be considered a perfect one. With regard to the £3000 claimed in respect to the sale to Plymouth of a portion of the undertaking, he argued that this was capital. At any rate, it would be necessary for the Umpire to specify in the award whether the same was revenue or capital. As to the bulk of the claim for surplus land, he said the whole of that was represented in the capital. The Company were now asking to be paid twice over for this land. In conclusion, the learned Counsel referred to the letter written in 1898 by the Corporation to the Company, offering to purchase the undertaking. At that time, the Corporation were anxious to acquire without going to Parliament, and offered terms which he considered very advantageous. But they did not bind the Corporation. They had not, at the time the offer was made, the information as to the position of the Company they now possessed; and if they were making the offer now, they would not put forward any such terms. He therefore asked the Umpire to disregard this offer altogether.

Witnesses were then called on behalf of the Corporation.

Mr. *J. F. Burns*, Borough Surveyor of Devonport, examined by Mr. LLOYD, said there was no necessity to remove the Company's offices, as they were in the most convenient part of the town, being near the Guildhall. He thought the estimate of 5s. per foot was too high for the land. He should put leasehold land at 1s. per foot.

In cross-examination, witness admitted that the Corporation had secured a site for new municipal offices near the Technical Schools and South-Western Railway. This would be a convenient site.

Mr. *Dudley*, a Surveyor and Valuer to the Board of Trade and War Department, gave evidence as to the value of the Company's surplus lands, and the site of the offices. He contended that buildings on that site would not be a financial success, and he disputed Mr. Berry's valuations.

Friday, April 24.

Mr. *Dudley* concluded his evidence this morning.

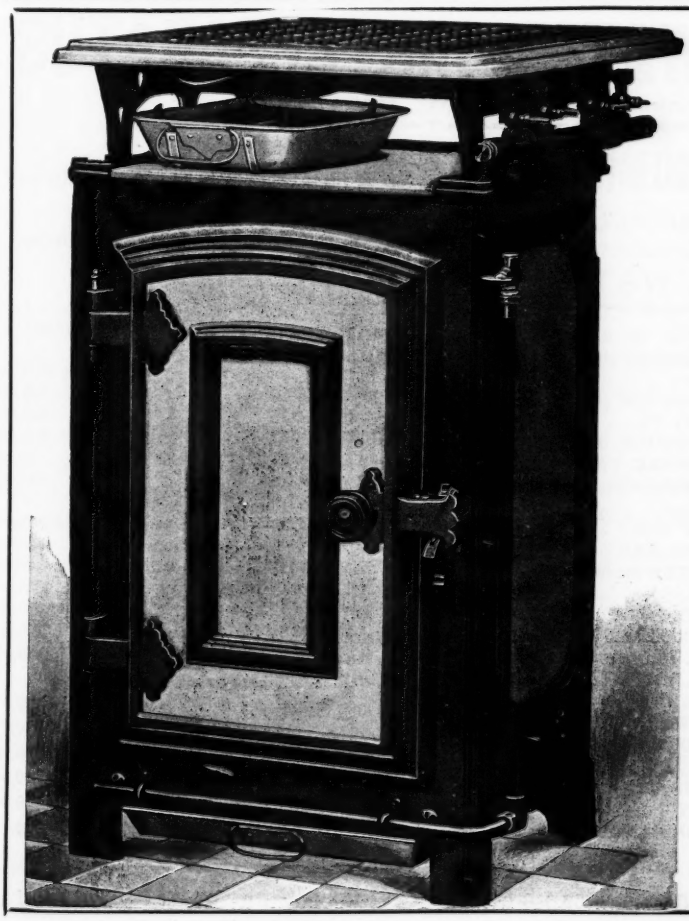
In cross-examination by Mr. DUKE, witness admitted that he was only instructed on the previous Monday, and the next day he walked over a portion of the property for the purposes of valuation. He made his valuation after he had seen Mr. Body's figures.

Mr. *J. W. Stone*, Surveyor of Lands in the Department of the Director of Works of the Admiralty, said there was a difficulty in determining the quantity of water that was delivered through the 6-inch pipe to which the Admiralty were entitled by the Act of 1893. However, a meter was fixed in 1900. During 1901, the Admiralty received through the 6-inch pipe approximately 78 million gallons only, and in 1902 rather less than 73 millions. A number of auxiliary supplies were paid for in 1902 to the extent of upwards of £2000; but they claimed that they were entitled to 521,000 gallons (but had agreed to accept 480,000 gallons) per day through the pipe without payment of anything beyond a sum already fixed.

Mr. *C. E. Fryer*, Board of Trade Inspector of Fisheries, said the Board had had communications with the Company with regard to the construction of fish passes in their weirs. In 1896 or 1898, they called upon the Company to construct passes, and the Company objected on the ground that it would have a considerable effect on their dry-weather flow of water. It was the habit of salmon to go to the upper parts of streams for spawning, and the fish were making headway up the river all the year round, so that passes were necessary. He said the position of the Board of Trade was that the Company raised their weirs, and Parliament insisted that fish passes were to be constructed.

Mr. BALFOUR BROWNE remarked that the Act of Parliament was over both the Company and the Board of Trade; and the matter would be fought out elsewhere.

Mr. *W. Lyttleton*, Chairman of the Lands, Finance, and General Purposes Committee of the Devonport Corporation, went into details as to the value of the Company's undertaking, and said that the values placed upon the various portions of it were extravagantly high.



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Mr. *S. Wood*, of Messrs. Alfred Lass, Wood, and Drew, gave evidence as to the financial position of the Company.

Mr. *J. Diggle* said for the last five years he had been advising the Corporation of Devonport as to their water supply. The present reservoirs of the Company were inadequate, having accommodation for only 23 million gallons of water, or about nine days' supply. He said the conveyance of the water to Devonport by an open leat was not at all satisfactory, because the channel was not fenced in, and the water was open to pollution and loss by evaporation. A pipe should be laid from the drainage area to Devonport. It would not follow the course of the leat, which was a winding one, and therefore it would be lessened in value. When the Bill was before Parliament for additional works, the Company's Engineer estimated that the piping of the leat would cost from £92,000 to £95,000; and witness's estimate for a smaller pipe was from £50,000 to £60,000. Assuming that Mr. Fitzgerald's construction was correct, the claim of the Admiralty would place a very heavy onus upon the Company. Others matters which might prove serious were the rights of the Duchy of Cornwall and Sir Massey Lopes; while there was also the trouble of the fish passes.

Saturday, April 25.

Mr. *Diggle* continued his evidence, and accepted Mr. Eaton's figures as regards the total income and expenditure; but he arrived at the valuation on the 3½ per cent. table, as against Mr. Eaton's 2½ per cent. table. Witness's total valuation was £221,417; but if the claim of the Admiralty was established, the value of the undertaking would be £156,331.

By Mr. BALFOUR BROWNE: Witness had only had the means of estimating the flow; but he still thought, in spite of the figures given, that the dry-weather flow was very much below what Mr. Francis stated. In order to make the income secure, he would ask for £63,000 for the piping of the leat alone. If the undertaking was an absolutely perfect one, he would have allowed 30 or 31 years' purchase; but if they were not going in for any works in order to attain perfection, he would not allow above 20 or 21 years' purchase.

Mr. BALFOUR BROWNE: Do you admit that any water-works in the country are worth 40 years' purchase?

Witness: No, I do not.

What is the highest multiplier you would have for an absolutely perfect works?—Assuming an absolutely perfect works, and having regard to the state of the Money Market at the present time, I should not put it down at more than 31 years' purchase.

Very well, we see your basis?—In the purchasing of water undertakings I always consider that a corporation should give a full liberal value.

Col. *Raven Hill*, of the Admiralty, gave evidence as to Devonport Dockyard.

Mr. *Baldwin Latham*, said the open leat was not at all satisfactory for the requirements of the present day. He considered that the undertaking was far from secure, because of its obligations to various bodies.

Mr. *Strahan*, said he knew that the dry-weather flow at Plymouth in recent years had never got below 1 cubic foot per second per 1000 acres. The watershed had a granite formation as in the present undertaking. When he looked at the dry-weather flows put in by Mr. Francis, he noticed that it was not so prolific as the Plymouth watersheds; but, on the other hand, it was more prolific than the Torquay watershed. There was an element of uncertainty as to the stability of the undertaking. If the leat was piped or improved, there would be a saving. He had listened to the evidence for the Company—that the valuation was based on the "Consol theory." He was blind in this matter to any such theory; he had tried to understand it but was unable to do so. It seemed to him to be incontestable that the stock of a water company could not possibly have the security of the National finances. Consols had a preferential value; and it could not be a standard. The witnesses who gave evidence in regard to this matter were, he asserted, very illogical. He also regarded the income of the Company as insecure in several respects, because of the liability to have the take of the Admiralty increased by 280,000 gallons per day, the claim of landowners, Plymouth competition, heavy expenditure, risk of not obtaining Parliamentary sanction to the scheme of the Company, the risk of having to supply fish-passes, and the question of dry-weather flow. He considered the essential question in connection with the valuation was that of the multiplier to be used; and he put it in the simplest form he could. He had had regard to the present value of money; and he had come to the conclusion that 28·57 years' purchase was the full value of the undertaking, and he hoped the opposite side would do him the justice to say that his was the judgment of a trained mind. (Laughter.) His valuation worked out the same as Mr. Diggle's—less 5d. only.

This concluded the evidence.

Mr. FITZGERALD, before addressing the Court, asked Mr. Balfour Browne what his construction of the Admiralty clause was.

Mr. BALFOUR BROWNE: That I am bound to supply with water through that pipe His Majesty's Dockyard at the town of Plymouth Dock, and that that does not include the Keyham Yard or the Keyham extension, and that they have no right to have from me one drop of water out of the old limits of the Dockyard at the town of Plymouth Dock.

Mr. FITZGERALD: You mean as the same existed at the passing of Act?

Mr. BALFOUR BROWNE: Yes.

Mr. FITZGERALD said his contention would be that the Admiralty were entitled to the whole supply of water coming from the 6-inch pipe, and to use it for their different departments in the Devonport Dockyard as it existed to-day. That was what the Admiralty claimed. If his friend was right, this income should go into the valuation, and the valuation ought to proceed on the basis that the income was one to which

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SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
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SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
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they were legally entitled, and which was likely to continue. On the other hand, if the Admiralty's contention was right, it was an income which might come to an end to-morrow, and the undertaking—instead of receiving £2070 as it did now—would be receiving only £425. It was an important matter, and involved about £60,000. Therefore, he must now ask the Arbitrator to say definitely whether he would state a case for the Court on this point. He also mentioned two other matters of importance and in respect of which he should make a similar request. One was the question of whether the Company were entitled to back-dividends, and the other was that they were claiming £19,000 in respect of an advantage of 1 per cent. on a portion of their preference capital.

The ARBITRATOR said he thought they ought to be allowed to take advice before making a definite statement.

Mr. FITZGERALD agreed, and asked, as an alternative, that before the award was given, there should be an intimation to the parties as to whether a case would be stated or not; so that the Corporation should have an opportunity of going to the Court (in case this was refused) and getting an order that a special case should be stated for the opinion of the Court.

The matter was left as asked; and Counsel having addressed the Court, the proceedings came to a close.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 2.

Sulphate of Ammonia.

More seasonable weather has brought about a revival of the Home demand; but export requirements, beyond deliveries on contracts, have been on a limited scale, and the month opens with some accumulation of stock in the hands of makers. Consequently, the closing quotations are £13 per ton f.o.b. Hull, £13 2s. 6d. per ton f.o.b. Liverpool, and nominally £13 5s. per ton f.o.b. Leith. With forward delivery offering at a very substantial discount on spot prices, buyers, as might be expected, are postponing the covering of their further requirements as long as possible, and are requiring a concession on spot prices for May and June delivery. For July-December delivery, makers quote £12 10s. per ton.

Nitrate of Soda.

There has been an improvement in the demand for this article, but not sufficient to justify an advance upon 9s. 6d. and 9s. 9d. per cwt. for ordinary and refined qualities respectively.

LONDON, *May* 2.

Tar Products.

The markets generally are quiet; and there is a decided absence of demand. Pitch is in practically the same position. There has been rather more inquiry from South Wales for early delivery; but values, on the contrary, appear to have decreased, judging by the quotations reported from France and Belgium. A small quantity of 90 per cent. benzol was sold at 9¼d. for prompt delivery, while an offer of 7d. was declined for 50-90 per cent., May-June. Solvent is in a very depressed condition. Business is reported for May-October at very low prices in the North. One or two small parcels of toluol have been sold for delivery in France at 7¼d. and 7⅜d. prompt. Crude carbolic is in strong demand; and business has been done in 60's for May-June at 1s. 6½d, to 1s. 6⅝d. For July-December, 1s. 7d. has again been declined. Crystals are very quiet; the German producers appearing to monopolize the market. Creosote is quiet; and prices are easier all round. In anthracene, business is reported at 1⅜d. per unit for "A" quality, 40 per cent.; and there are still buyers for July-December, and and also all over 1904. Makers, however, do not care to entertain business so far forward at present, unless at a greatly enhanced value.

The average values during the week were: Tar, 22s. to 28s. Pitch, London, 57s. to 57s. 6d.; east coast, 54s. to 54s. 6d.; west coast, 52s. 6d. to 53s.; Benzol, 90 per cent., 8½d. to 9d.; 50-90 per cent., 7d. to 7½d. Toluol, 7d. to 7¼d. Crude naphtha, 3d.; solvent naphtha, 7d. to 8⅛d.; heavy naphtha, 9d. Creosote, London, 1½d.; North, 1⅝d. to 1¾d. Heavy oils, 2d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 6½d. to 1s. 7d. Naphthalene, 30s. to 47s. 6d.; salts, 22s. to 24s. Anthracene, "A" quality, 1⅜d. to 1⅝d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is very dull with an absence of business. Beckton quote £13 5s. for the end of May, and £13 2s. 6d. for June; but consumers will not pay these prices at present—in fact, they appear perfectly indifferent to the market. There are sellers on Beckton terms at £13 2s. 6d. for prompt delivery. In Leith, it is very difficult indeed to fix the value. Sellers ask from £13 5s. to £13 7s. 6d.; but consumers are not at all inclined to pay these prices, and would not exceed probably £13 2s. 6d. In Hull, it is almost impossible to fix the value; but there are sellers at £13 2s. 6d. for May-June. In Liverpool, a little business is reported at £13 2s. 6d. for May-June, but the transactions are very limited.

Municipalized Gas-Works in Italy.—Though the tendency to municipalize gas undertakings in Italy is prevalent in places where the population is not large, there are towns of some importance in which the gas supply is in the hands of the local authority. For example, Voghera, with a population of 20,442, municipalized the gas-works in 1899; Vicenza, with 43,703, in 1897; and Bologna, with 152,000, in 1900. The works at Cosenzo are reported to yield satisfactory results; Spezia entirely constructed the works; and Padua, with an initial outlay of 380,000 frs., made profits from Aug. 1, 1896, to Sept. 30, 1897, of 270,000 frs. The success of the several undertakings has led to gas-works being erected at Pavia.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I send you the statement by Mr. W. R. Herring regarding the duration of retorts and retort-settings in Edinburgh and Leith,* because it reveals a state of matters which is very favourable to inclined retorts. If an inclined retort has so much longer life than a horizontal one, as is shown here, there must be great saving in using such retorts. It will be observed that in the Edinburgh works the average life of ordinary retorts has, since 1888, been 354 days, and that in the same works inclines have been in use for 782 days, and are still in working order. That is to say, the inclines have already lasted more than double the time the horizontals have. Again, the coal carbonized per foot of retort is all but double what has been accomplished with horizontals in Edinburgh, and is more than double that at the Leith works. Per 20 feet of retort, the quantity of coal has also been nearly double that put through horizontals in Edinburgh, and a great deal more than double the amount put through in the Leith works. Whatever be the reason, or combination of reasons, which has led to the attainment of what has been achieved by inclined retorts in Edinburgh, the bare statement of the results is sufficient to rivet attention upon the process.

The Commissioners have begun to show their new works at Granton to the public on Saturday afternoons. The first of these visits was last Saturday, when 130 persons attended. They were received by Mr. Herring and his Assistants, and were shown over the place. Mr. Herring stated at the meeting of the Commissioners on Monday that there are applications by about 250 persons for to-day and also for next Saturday. The visits are not without condition—but the condition is the very trifling one of writing to the office of the Commissioners for a card.

In connection with a recommendation by the Works Committee, to the effect that the employees of the Commissioners who come in contact with the public should be furnished with an official cap, Mr. D. Purves, the Convener, stated that, unfortunately, lately men had been going through consumers' houses representing that they were from the Gas Commissioners, and that one even went the length of borrowing money, which he said the party could deduct from the gas account. The Commissioners fixed the price of gas for public lighting during the year from Whit-Sunday next at 2s. 5d. per 1000 cubic feet net. The price to ordinary consumers is 3s.

Having wakened up to the fact that the public lighting in the city is very unsatisfactory in amount, there would appear at present to be danger lest the Corporation of Edinburgh should rush into an extreme the other way, the cost of which would soon be felt to be burdensome. As already stated, the Cleaning and Lighting Committee recommended the extension of the electric lighting, and also that incandescent gas lighting should be introduced into a number of streets. This recommendation came before the Town Council on Tuesday. Mr. R. Menzies, the Convener, said the recommendations involved an expenditure (annual, I suppose) of £2880, and that some day they must come to have the whole city lighted by electricity. At present, they paid £13 a year for each electric arc lamp. They were promised a reduction of 10s. per lamp, which would amount to £450 a year. If the cost were reduced to £10 per lamp, they might see their way to light the whole city by electricity. The extra cost would be between £8000 and £10,000, which was less than 1d. in the pound on the rates. He suggested that the subject be sent back to the Committee in order that they might procure further information. Mr. Douglas thought that, in view of the fact that in many cases incandescent gas lighting was being substituted for electric lighting, the Committee should report on the cost of lighting the whole city by incandescent gas-lamps. Mr. D. Purves, the Convener of the Works Committee of the Gas Commission, said that that body were at present considering the subject of the cost of lighting the whole city by incandescent gas-lamps; and he was certain they would be able to submit a statement which would surprise the Electric Lighting Committee. Mr. Mackenzie, the Convener of the Electric Lighting Committee, said he had no objection to the question of lighting by gas being considered; but he urged that the recommendations as to electric lighting be gone on with. If it were the case that incandescent gas was being substituted here and there in England for electricity, in those places the charge for electric lighting was nearly double what it was in Edinburgh. The subject was sent back to the Committee. A couple of days later, a previously prepared document by the City Chamberlain—an official upon whom there was so little call for taking up the subject of public lighting that he begged to be excused for doing so—was issued. The only part of the subject which appealed to him was that relating to electric lighting. He postulates that if the whole city were to be lighted by electricity on the basis of one arc lamp displacing three-and-a-half gas-lamps, the number of arc lamps which would be required would be 3791; and the annual cost of them would be £49,203—an increase of about £20,000 a year. Seeing that the Electric Lighting Committee have agreed to reduce the charge by 10s. per lamp upon 103 lamps being added, he asks if it be too much to expect that, on 3000 lamps being added, they should not reduce the charge to £10 per lamp per annum. If that were done, the total charge would be £38,000, or about £8000 more than the present cost of public lighting, and equal to about ¾d. in the pound upon the rates. So far as he can judge, the electric lighting of the whole city appears to be a practicable proposal; and he considers it right, when the Committee are considering the question of improved lighting, partly by incandescent gas, that the figures he has brought out should be before them. The lighting by incandescent gas involves a considerable initial outlay for lanterns, &c.; and apart from the question of whether that method or electric lighting gave the best value for the money, he thinks it a pity to incur the initial expenditure for incandescent

* See page 290.

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gas if there is any really likelihood of electric lighting being adopted generally throughout the city. I wonder how this man exercises his reasoning powers. Presumably he gets over anything which is not to his liking by ignoring its existence. Thus, he sees considerable outlay for lanterns for incandescent gas; but he is apparently oblivious of the very much more considerable outlay, not merely for lanterns but for lamp-posts, for electric lighting. There is another element in this matter which is ignored by both Mr. Menzies and the City Chamberlain, which is that, before the whole city could be lighted by electricity, it would be necessary to lay cables into every street, lane, and court—at what expense? Certainly at a cost which would not be covered by an annual charge of 1d. in the pound upon the rates. This outlay would, of course, not be a burden upon the Cleaning and Lighting Committee, but would be a capital charge upon the Electric Lighting Committee. In the case of incandescent gas lighting, the capital charges have all been incurred, and the advocates of universal electric lighting, in keeping out of view the huge initial capital outlay which their scheme involves, lay themselves open to the charge of attempting to hoodwink the public. Ratepayers have good reason to long for the disclosure of the Committee's proposals.

A further step in the wearisome and tortuous way by which the Corporation of Falkirk are approaching the subject of the provision of new gas-works for the burgh, was taken at the last meeting of the Town Council, when the Special Gas Committee reported that they had received from the Gas Manager his statement, "giving dimensions and weights of the various buildings and gas plant utilizing ground to the utmost limit," accompanied by block plans of proposed works and levels of ground; and that these documents had been sent on to the Architects, who are to report upon the suitability of the site for a gas-works, with a request that they report as soon as convenient. The Council approved of what had been done. The Finance Committee reported that the Burgh Chamberlain had redeemed £155 of stock. A long discussion took place upon a proposal to have a brick erection which had been recently built at the gas-works removed. It was said that the structure was an obstruction to a footpath, and that while ostensibly its purpose was to provide ventilation for the workmen in the gas-works, its real object was to bring home to the community the notion that the gas-works were too small for the production of the quantity of gas which is required. The desire for the removal of this offending structure seemed to have arisen suddenly—a sort of afterthought; for the reply was that it was put up as part of the scheme whereby Mr. Kincaid expected to be able to increase the output of gas by 10 per cent., which had been effected. The motion was defeated by eight votes to five, so that the structure remains.

We have another announcement in the "Dundee Advertiser" regarding the gas supply of the city, which is so premature that it conveys next to no information. The Gas Committee, it is said, met on Wednesday night, and were informed that a Special Committee were engaged in looking into the coal contracts. A question was asked as to whether the prices would be lower this year than last; and the reply was that they would be something similar to last year, but that, with care in placing the contracts, a saving might be effected. It was mentioned that there had been an increase in the output of gas for the past year of 14 million cubic feet; and indication was given that any reduction in the price of gas would depend on the saving which had been secured in the cost of working, and by economies in the placing of the coal contracts. A great deal of this is conjecture, which may not be realized. The only items of information are with reference to the tenders for coal (the accuracy of which I greatly doubt), and the output of gas. The output reported a year ago was 658 million cubic feet; and the estimate for the year just closed was 660 millions. The actual output would thus be 672 million cubic feet, or 12 million feet above the estimate.

The Corporation of Perth have at last brought the law to bear upon those gas consumers who were so strongly of opinion that they were being overcharged that they declined to pay the accounts rendered to them. In the Small Debt Court yesterday, a number were sued by the Corporation for the amounts due. The hearing was, however, adjourned for a week—all the cases having been settled except two; and it was stated that they also would be settled out of Court. It is nearly a year since Mr. Newbigging reported to the Corporation that the charges had been correctly made. No one can, therefore, complain that they have been unnecessarily hurried in the matter of payment; and the further reflection may be made that by this time there will probably be another crop of arrears to deal with.

The Pitlochry Gaslight Company have just completed the erection of a new retort-house, part of their scheme for the translation of the gas-works to a new site, on the opposite side of the railway. They had previously erected a gasholder upon it, capable of holding 44,000 cubic feet. The new retort-house has been built from plans prepared by Mr. W. M'Crae, of Dundee. There are three ovens, of five retorts each, which is a much greater provision of plant than is at present required. The bench is fired on the regenerative principle. It is stated that the whole of the plant has now been removed from the old works, and that all that remains to be done is to construct a tar-well. From the improvements which have been made, it is expected that there will be a saving of 15 per cent. in the production of gas. The total cost of the new works has been about £4000.

On Wednesday of this week, an extension to the water-works which supply the town of Crieff was formally opened by Mrs. Finlayson, the wife of the Provost of the burgh. The works include a new reservoir, circular in shape, 100 feet in diameter, and 20 feet deep, and of a holding capacity of 981,750 gallons (sufficient for between three and four days' supply), and two filters, each 60 ft. by 40 ft. by 5 ft. 6 in. New main pipes have also been laid from Loch Turret, which is the main source of supply. The cost of the extension has been about £12,000; and that of the works since they were constructed in 1872, £22,000. The Engineer for the extension was Mr. Gilmour.

A poll having been taken with regard to the proposal of the Dover Corporation to purchase the local electric light undertaking, a majority of 772 ratepayers have declared themselves in favour of the project.

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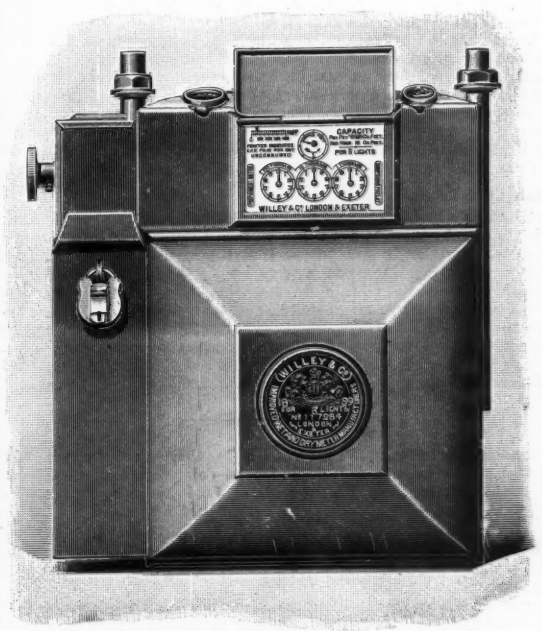

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COAL TRADE REPORTS.

Lancashire Coal Trade.

As anticipated in previous reports, the isolated concessions in house-fire coal prices, and the competition of lower rates in other districts during the past month, have led to a general reduction in the list basis rates coming into operation with the commencement of May. The reduction has, however, been limited to the various classes of fuel used for house-fire purposes. The basis rates for these may now be quoted as ranging from about 14s. and 14s. 6d. per ton for best Wigan Arley coals in the Wigan district to 15s. and 15s. 6d. for the best house-fire sorts in the Manchester district, 12s. to 13s. for seconds house-fire coal in the West Lancashire district to 14s. and 14s. 6d. in the Manchester district, and from 10s. to 10s. 6d. for the commoner sorts in the Wigan district up to 13s. 6d. in the Manchester district. The position with regard to the lower descriptions of round coal used for steam, forge, and general manufacturing purposes, and for locomotive fuel and gas-making requirements remains without any very material change. A fairly active inland demand for steam and forge purposes is maintaining prices at late rates, ranging from 8s. 6d. and 8s. 9d. up to 9s. and 9s. 3d., according to quality. For gas coal contracts, prices have not yet definitely settled down to the basis likely to rule during the ensuing season. Consumers expect a reduction of 6d. per ton on last year's basis. Colliery owners generally, however, are disinclined to consider such a reduction, and so far as anything has transpired to govern prices, it would seem to be a splitting of the difference, representing a reduction of 3d. per ton on last year. Much the same applies to locomotive fuel. The very firm tone reported for some time past with regard to engine classes of fuel is being well maintained. There is no further advance; but collieries have no difficulty in booking new business at an increase of 3d. per ton on common slack to 6d. per ton on the better qualities, and there is still a scarcity of supplies on the market, especially in the best descriptions of engine fuel. At the pit mouth, common slacks are fetching from 4s. 6d. to 4s. 9d. and 5s. per ton, good medium sorts 5s. 9d. to 6s. 3d., and the best qualities from 6s. 9d. to 7s. 3d.

Northern Coal Trade.

There has been rather more activity in the steam coal trade of the North, and there has also been the partial settlement of the gas-coal contracts. For steam coals, the inquiry is fuller. Best Northumbrian steam coals are steady at 10s. 9d. per ton f.o.b., and in good request, the collieries being briskly employed; second-class steams are 9s. to 9s. 6d., and steam smalls 5s. 3d. to 5s. 9d. In the gas coal trade, the demand is moderate for occasional cargoes at from 8s. 6d. to 9s. per ton f.o.b. Much interest has been felt in the settlement of part of the contracts for gas coals for London, and rumours conflict as to the prices decided. As far as can be learnt, some coals have been contracted for, with Tyne shipment, at about 8s. per ton f.o.b., and some Yorkshire coals have been bought at slightly lower figures. In the course of a week or so, rather fuller particulars will be known. Gas coke is now in lessened production, and the price seems to be firmer at from 12s. 3d. to 12s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There is a little more activity, now that shipping to Baltic ports is beginning, and contracts are being settled at home. Values, however, remain unaltered. It is expected that there will be little change in prices during the summer, as matters seem to be well settled all round. The prices quoted are: Main 8s. to 8s. 3d. per ton f.o.b. Glasgow, ell 9s. to 10s., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 208,532 tons—an increase of 14,980 tons upon the preceding week, and of 13,710 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,081,742 tons—an increase of 145,967 tons upon the same period of last year.

Reductions in Price.—The Brixham Gas Company have reduced the price of gas by 6d. per 1000 cubic feet to consumers using it for cooking purposes. At Penzance, the price of gas is to be reduced from 4s. 3d. to 3s. 9d. per 1000 cubic feet from July 1 next.

Gas Poisoning Case.—An old lady named Mary Anne Edgcombe was found dead in bed at Plymouth last Friday week, under circumstances which showed that she had been poisoned by an escape of gas. The deceased, who was 84 years of age, had been in the habit of burning gas all night in her bedroom, but recently had complained that this made the room too warm, and had turned it out when going to bed. On Friday morning, when she was visited, she was found dead with the room full of gas. The tap was partly turned on. At the inquest, which was held later in the day, the Coroner expressed the opinion that she had inadvertently turned on the gas after turning it off; and a verdict of "Accidental death" was returned.

Yorktown and Blackwater Gas Company.—At the recent annual meeting of this Company, the Chairman (Mr. A. H. Claypole) stated that the make of gas in the twelve months ending Dec. 31 had risen by 2,446,000 cubic feet, and the revenue from its sale by £462 14s. 9d. The yield per ton of coal was 9505 cubic feet, against 8411 cubic feet in 1901. The total expenditure in 1901 bore a proportion to the revenue of nearly 91 per cent. Last year the proportion was 81½ per cent.; showing a reduction of 9½ per cent. in the working expenses of the Company. This improvement was, he said, largely due to the efficient way in which their new Engineer and Manager (Mr. J. Meiklejohn) had carried out his duties. A dividend of 5 per cent. was declared on the original shares of the Company. The text of the Aldershot Gas and Water Company's Provisional Order, as agreed to by the Board of Trade, has been published; and it is specified in clause 27, relating to the application of moneys, that it shall not be lawful for the undertakers to expend or apply any part of the capital authorized to be raised, or of the money belonging to the undertakers, for the purpose of affording a supply of gas in any part of the district of the Yorktown and Blackwater Gas Company.

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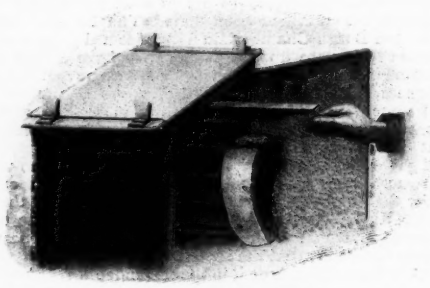

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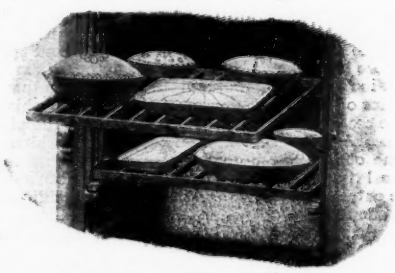

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Reduced Cost of Public Lighting at Smethwick.—The Public Works Committee of the Smethwick Town Council have arranged with the Gas Committee for a revision of the cost of public lighting, now that the incandescent system has been introduced, which will save the borough £230 per annum.

Selby Water Supply.—The Selby Urban District Council have consulted Mr. Percy Griffith, M.Inst.C.E., F.G.S., of Westminster, with regard to the future development of their water supply undertaking. The limits of the present works have now been reached; and Professors De Rance and Percy Kendall have advised a new site some distance from the town. This scheme, if adopted, will involve some interesting questions in connection with the protection of underground sources of water supply.

Reduction in Charge for Public Lighting at Cardiff.—The Cardiff Gas Company have notified the Lighting Committee of a reduction in the price of gas used for street lighting purposes. Alderman Carey, in announcing the fact, said that this was a voluntary proceeding on the part of the Company; but he pointed out that the reduced price of £2 3s. 2d. per lamp was about 2s. 6d. more than was paid before the great advance in coal in 1901, while now coal was down to practically the same price as prevailed before that year. Dr. Smith suggested that the Company should be requested to make a further reduction; and this course was resolved upon.

Sale of Shares.—On Tuesday last, Mr. Alfred Richards sold by auction, at the Mart, Tokenhouse Yard, E.C., the following stocks and shares: A new issue of £6000 of 4 per cent. perpetual debenture stock in the Ilford Gas Company, at from £100 5s. to £100 7s 6d. per £100 of stock; £5000 of new ordinary stock in the Dover Gas Company, at from £140 to £145 per £100 of stock; 30 £10 ordinary shares in the Gas-Meter Company, Limited, at £27 10s. per share; and £200 of original stock in the Brighton and Hove Gas Company at £214 per cent. Out of the new issue of 5 per cent. preference stock of the Horley District Gas Company which was offered, only £270 worth realized par.

New Joint-Stock Companies.—The Auto Gas Plant Company, Limited, has been registered with a capital of £2000, in £1 shares, to acquire the patent granted to C. Whitfield (No. 13,983 of 1901) for improvements in apparatus for the generation, purification, and storage of combustible gas, and to carry on the business of engineers, contractors, manufacturers of, and dealers in, all kinds of gas appliances, &c. The Air-Stove and Gas Engineering Company, Limited, has been formed with a capital of £6300, in £1 shares, to acquire and work patents or inventions relating to gas stoves, fires, and heating and lighting appliances, methods for standardizing or enriching gases and vapours, &c., and in particular to acquire a patent granted for the manufacture of Delin's sur-carburateur (No. 3217* of 1900), to adopt an agreement with G. Delin, and to carry on the business of wholesale and retail manufacturers of stoves and lighting power appliances, &c.

The French Welsbach Company.—The Paris Correspondent of the "Financial Times" states that the annual meeting of the French Incandescent Gaslight Company was held last Thursday. The results of the trading in 1902 were not so satisfactory as those of the previous year; but the profits nevertheless amounted to £38,200, out of which a dividend of 5 per cent. was paid, *plus* a supplementary dividend of 24s. per share. There were various payments to special reserve funds; and a small balance remained over, making the total amount carried forward above £42,000. The Company place great faith in a new electric arc lamp which they have patented. An interesting point in the report is, he says, the increasing difficulty of manufacturing and selling Auer incandescent gas-mantles at a sufficient profit, owing to the enormous foreign competition in France. German manufactured mantles are imported and sold, in spite of the duty, at a lower figure than those made locally.

Extensions at Chesterfield.—Some figures showing the remarkable progress made by the Chesterfield gas undertaking since its transfer from the Company to the Gas and Water Board were quoted in the course of a Local Government Board inquiry recently. Since 1896, when the works were taken over, £45,000 has been borrowed, and the plant has been renewed on up-to-date lines. But so heavy has the increased demand for gas proved, that the provision made has become altogether inadequate. During the past two years, the number of consumers has increased 82½ per cent.; while the consumption in the twelve months ending March 31 last was 14½ million cubic feet more than that for the preceding year. Under these circumstances, the Board are desirous of borrowing a further sum of £24,000, to enable them to double the producing power of the works. The Inspector (Mr. R. H. Bicknell) suggested that, in order that there should be no delay, the Board should, while waiting for the sanction of the Local Government Board, advertise for tenders for the work, subject to the latter Board's approval.

The Complaints as to Leicester Gas.—Mr. Alfred Colson, the Gas and Electricity Engineer to the Leicester Corporation, has had another opportunity of demonstrating that the quality of the gas he supplies is not so bad as many of the consumers wish the ratepayers generally to believe. On the 18th ult., he had a visit, at the Aylestone Road works, from the Editor of the Leicester "Pioneer"—a local advanced Labour organ—and a number of his friends, members and employees of the Co-operative Printing Society. He showed them how gas is produced; and though the work of the stokers appeared to the party to be exceedingly arduous, it was made clear to them that eight-hour shifts only mean three hours' real labour. After having had the various processes connected with gas making explained, Mr. Colson had a talk with his visitors about the so-called "bad gas;" and they believed him. They confess, in the current issue of their paper, that they "couldn't help it, because his argument seemed so incontrovertible." They left the works with the conviction that it was not the gas, but the "faulty, old-fashioned, out of-date fittings," which caused the complaints. What was the remedy? They recognized it: "To pull them out." They parted from Mr. Colson with expressions of thanks for "three hours crammed with enlightenment and amazement."

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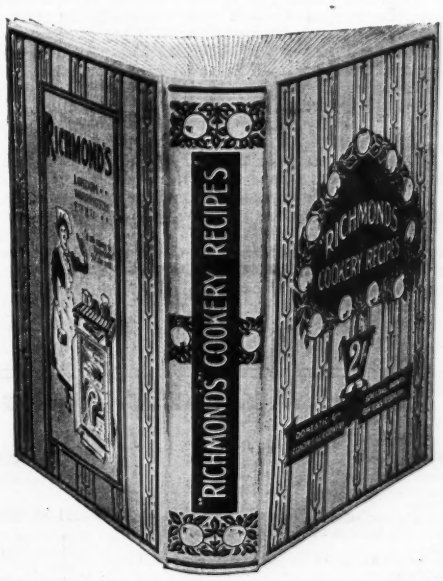

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WARRINGTON. STRATFORD.

Cost of Street Lighting in Bradford.—It will be remembered that last year a sum equal to £21,000 per annum was paid over to the Bradford Corporation Gas Committee out of the rates to defray the cost of the public lighting, which had hitherto been borne entirely by the gas consumers. This year £31,000 was asked for; but a Sub Committee of the Finance Committee have resolved that the contribution shall be the same as last time.

Leeds Water-Works Arbitrations.—At a recent meeting of the Water Committee of the Leeds Corporation, the awards in two arbitration cases lately decided were made known. One related to the purchase of 853 acres of moorland at Thornthwaite-with-Padside from Sir H. D. Ingilby. Sir John Rolleston, M.P., was the Umpire, sitting with Mr. J. H. Hanson and Mr. Charles Gott. The highest valuation was £40,820; the lowest, £4244; and the award was for £10,837. The other case related to the purchase of 54 acres of land at Timble Great, near Otley, from Mr. F. Margerison. The claimant's witnesses' valuation was £4080, and that of the Corporation's witnesses £1599. The award was £2557.

Rotherham Gas and Water Supply.—The general result of the trading of the Rotherham Corporation Gas-Works for the year ending March 25 was a gross profit of £13,196, against £9071 in the previous twelve months. After debiting loan charges, there was left a net profit of £4053. From this had to be deducted the value of the gas used for public lighting (£3052), leaving a surplus of £1009. The water-works showed a gross profit of £5341, compared with £4631 the previous year; but after deducting loan charges (including contribution to the cost of the Langsett Water Act), the final result was a deficit of £674. Had it not been for the heavy renewals required, there would have been a slight surplus.

Last Year's Strikes and Lock-Outs.—A Board of Trade return has been issued, giving statistics of strikes and lock-outs in the United Kingdom in each of the past ten years, shows that the number recorded for 1902 was 442. The number of workpeople affected was 256,667, and the aggregate duration in working days 3,479,000. The percentage of workpeople affected by strikes and lock-outs due to questions of wages was 48·6; to questions of hours of labour, 2·6; regarding employment of particular classes or persons, 9·8; and other causes, 39. The results of the strikes and lock-outs were as follows: In favour of employers, 30·4; in favour of workpeople, 31·6; and in a compromise, 35·7. The methods of settlement of the disputes were: By arbitration 16, affecting 4481 workpeople; by conciliation and mediation 13, affecting 7129 workpeople; by mutual arrangement 316, affecting 222,547 workpeople; and by other ways 97, affecting 22,510 workpeople. Under the Conciliation Act, seven disputes involving stoppage were settled, as well as ten not involving stoppage.

Kimberley Water-Works Company, Limited.—At the recent annual meeting of this Company Mr. J. Jackson, in moving the adoption of the report, said the year 1902, though not attaining to the exceptional prosperity of 1901, had been a good one—in fact, the best they had had, with one exception, since 1889. The consumption of water had reached 172 million gallons, or 25 millions less than during the foregoing year, the receipts of which were swollen by the requirements of the garrison. Expenses connected with litigation with the Municipality and the parliamentary expenses had made serious inroads into the profits, which, however, stood at a fairly good figure. The working expenses were almost identical with those of the previous year, though the net receipts for water were £5700 less. He thought the shareholders might look forward to two prosperous years during the remainder of the concession, which would expire on May 15, 1905, though there were already indications which pointed to the fact that they could not expect a recurrence of the exceptional prosperity of 1901 and 1902. The extension of the concession proposed was for 21 years; the maximum price for water would be 8d. per 100 gallons. The Company reserved the right to contract with non-meter consumers as at present. If the agreement were adopted, all legal proceedings between the two parties would be abandoned, each party paying its own costs. The motion was carried. The Chairman, in answer to a question, said the maximum price which the Company were now authorized to charge for their water was 1s. 3d. per 100 gallons; but they received nothing like this amount.

Carlisle Water Supply.—A special meeting of the Carlisle Town Council was held last Tuesday, for the purpose of considering whether the scheme to obtain a supply of water from Geltsdale by gravitation, as provided for by their Act of 1898, should be proceeded with. The Geltsdale Water Committee submitted two recommendations—that the work be at once put in hand, and that Messrs. James Mansergh and Sons be employed to carry it out. Mr. Scott, the Chairman of the Committee, said the scheme was absolutely necessary if Carlisle was to make any progress in the future; and he contended that the fact that the estimate of the cost had gone up from £130,000 to £243,000 was not a sufficient reason for abandoning it. On a vote being taken, 19 voted for the adoption of the recommendations, and 17 against. The work will therefore be proceeded with.

Ipswich Water Supply.—Mr. W. O. White, the Chairman of the Ipswich Water Committee, in moving the adoption of the annual report, stated that the receipts from water-rental for the year ending March 31 were the largest they had yet taken. If they had paid for the property, there would have been a sum of £10,000 in profit to go in reduction of the rates. As it was, nearly all this money was absorbed in the payment of interest on money borrowed, and of annual proportions of the principal amount; so that the net profit came to only £50. The sinking fund now stood at £16,038; and the total indebtedness on the undertaking was £253,343. A better supply of water had been provided than before; and he now believed it possible that the water-works might be efficiently carried on, and the loans repaid, without calling on the ratepayers for assistance. The report of the Engineer (Mr. Hamlet Roberts) stated that the supply of water averaged 20·04 gallons per head of the population, including trade purposes, which was a decrease of 1·51 gallons; and this showed that the methods adopted to reduce the waste had proved satisfactory.

The Bingley Urban District Council have decided to open up negotiations with the Bradford Corporation for the purchase of the Wilsden portion of the Clayton Gas Company's undertaking.

The Rushden and Higham Ferrers District Gas Company have placed an order with Messrs. R. & J. Dempster, Limited, of Manchester, for a complete installation of the Dellwik-Fleischer blue water-gas plant.

Advices to hand from Wigan state that the award of Lord James of Hereford on the miners' wages question was received by the Joint Secretaries to the Conciliation Board on Saturday. The decision is against both the 10 per cent. advance asked for by the men and the 5 per cent. reduction proposed by the masters.

The net profit of the Liverpool Gas-Fittings Company for the past year amounted to £1723, which, with the balance brought forward, left a sum of £2082 to the credit of profit and loss. The Directors have decided to place £500 to the reserve fund (making it £2500), and to recommend the payment of a dividend at the rate of 10 per cent. per annum, with a bonus of 1s. per share, free of income tax. This will leave a balance of £82 to be carried forward.

A very successful exhibition of the Richmond Gas Stove and Meter Company's appliances has been held at the Stone Town Hall, under arrangement with the local Gas Company. The exhibition was opened by Mr. J. Kendrick, Vice-Chairman of the Gas Company, who stated that arrangements had been made with Messrs. Richmond for a lady to canvass the town with a view to introduce gas-cookers in every house. Each afternoon and evening, Miss Hannay demonstrated the uses of gas-stoves in a convincing manner.

The Banbury and District Electrical Supply Company have "gone one better" than the now common free-wiring arrangement; for they offer, through a firm of local Electrical Engineers, whom they have appointed their contractors, to instal six electric incandescent lights free of charge in private houses of a minimum rental of £25 per annum. Lest, however, anyone should mistake this for philanthropy, the firm are careful to point out that the object is the further introduction of the electric light into private houses. Somebody would have to pay for these "free" fittings; and we feel sure it will not be the Electric Light Company.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CANVASSER, &c. Mid Kent Gas Company.
CARBONIZING AND YARD FOREMAN. Croydon Gas Company.
CARBONIZING FOREMAN. Coventry Gas-Works.
MANAGER AND COLLECTOR. Skegness Gas Company, June 5.
SERVICE LAYER AND FITTER. Clacton Gas and Water Department.
WORKING FOREMAN. Broughty Ferry Gas Department.
WORKING MANAGER. No. 4027.

Situations Wanted.

MANAGER OR DISTRIBUTION SUPERINTENDENT. No. 4025.
TAR DISTILLERS, MANAGER OR ASSISTANT. No. 4029.
TRAVELLER GAS-STOVE TRADE. W. W. Faversham.
WORKS' CLERK. C. B., Watford, Herts.

Agent Wanted by Constructional Engineers.

No. 4028.

Gas-Works for Sale. No. 4026.

Plant, &c., for Sale.

PURIFIERS, &c. Nantwich Gas-Works.
PURIFIERS, VALVES, HYDRAULIC MAIN, GASHOLDER, &c. Pitlochry Gas Company.
RETORT FITTINGS, &c. Sutton (Surrey) Gas Company.
VALVE (8-inch). Sutton (Surrey) Gas Company.

Plant (Second-Hand) Wanted.

PURIFIERS (2). Girvan Gas Company.

Sales of Stocks and Shares.

CHIGWELL, LOUGHTON, &c., GAS COMPANY. May 26.
GORING AND STREATLEY GAS AND WATER COMPANY. May 6.
GREAT YARMOUTH WATER COMPANY. May 2.
HORLEY GAS COMPANY. May 6.
LOWESTOFT WATER AND GAS COMPANY. May 26.
NEWHAVEN AND SEAFORD WATER COMPANY. May 27.
PORTSMOUTH WATER COMPANY. June 16.
SOUTHEND GAS COMPANY. May 26.
TOTTENHAM AND EDMONTON GAS COMPANY. May 12.

TENDERS FOR

Benzol.

WILMSLOW, &c., GAS COMPANY. Tenders by May 12.

Coal and Cannel.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by May 13.
BIRKENHEAD CORPORATION. Tenders by May 21.
COMMERCIAL GAS COMPANY. Tenders by May 11.
LIVERPOOL GAS COMPANY. Tenders by May 16.
RICHMOND WATER-WORKS. Tenders by May 25.
WILMSLOW, &c., GAS COMPANY. Tenders by May 12.

Condensers.

MANCHESTER GAS DEPARTMENT. Tenders by May 16.

Cookers.

WILMSLOW, &c., GAS COMPANY. Tenders by May 12.

General Stores, Oils, Paints, &c.

WILMSLOW, &c., GAS COMPANY. Tenders by May 12.

Meters, &c.

WILMSLOW, &c., GAS COMPANY. Tenders by May 12.

Pipes and Fittings, &c.

LEIGH (Lancs.) WATER DEPARTMENT. Tenders by May 16.

Tar.

ACCRINGTON GAS AND WATER BOARD. Tenders by May 12.
LONGTON GAS DEPARTMENT. Tenders by May 26.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

PURIFICATION & CHEMICAL CO., LD.,
JOHN WM. O'NEILL, Managing Director,
PALMERSTON HOUSE, LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications RE OXIDE to the COMPANY as above.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS,
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IT is worth your while to buy direct.
THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

AMMONIACAL Liquor wanted by
JOHN RILEY & SONS, Hapton, near ACCRINGTON.

PENNY-IN-THE-SLOT WORK.
H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

"A RAY OF LIGHT" and "HEAT RAYS." Both Pamphlets now in THIRD EDITION; nearly 120,000 copies having been sold since first publication last year.
Special abridged edition of "HEAT RAYS" for small Country Gas Undertakings not in competition with Electricity—Gas for Cooking, Heating, and Power. 4s. 6d. per 100.
T. E. PYE, Gas-Works, SANDWICH.

TO GAS AND WATER OFFICIALS.
GRAND Cycle Bargains, new and second hand "HUMBERS," "PREMIERS," "COURT ROYALS," "CENTAURS," "RUDGE-WHITWORTHS," "SWIFTS," "ROVERS," &c., on SPECIAL TERMS to Gas and Water Officials. Easy payments from 10s. monthly.
IMPERIAL CYCLE SUPPLY CO., COVENTRY.

MOTOR CARS.
MOTOR CARS for Pleasure or Business.
MOTOR VANS for Coin Collecting.
MOTOR TIP LORRIES, and TAR or OIL WAGGONS.
LAURENCE BELL, Gas and Motor Engineer, INNERLEITHEN and PEEBLES.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

EERSTE Hollandsche Yzererts Maaty
(First Dutch Bog Ore Company, Ltd.),
ROTTERDAM.
General Manager for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

STREET AND SHOP LAMPS AND LANTERNS.
MARK DUFFIELD & SONS (Established 200 Years), Makers of Street and Shop Lamps to own Pattern and Design. Any description of Lamp made. Inquiries invited.
London Manager: EDWARD PADFIELD, West India House, 96 & 98, LEADENHALL STREET, E.C.
Telegraphic Address: "EUPATHY, LONDON."

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

THE EVERSON COAL AND COKE COMPANY, LIMITED, BIRMINGHAM,
ASK for Prices of Gas Coke in any quantities, delivered into waggons at Sellers' Station.

GAS-METERS wanted, old disused Wet. Copper Lamp Frames, Brass, Pewter, Tin, Zinc, Lead Ashes, Old Copper Electric Cable, &c., for Cash.
J. SMITH, Canal Road, BRADFORD.

TRAVELLER, with good connection in South-Eastern Counties, lately representing good Firm, desires re-engagement. Excellent References. Age 27.
Address W. W., 83, Preston Street, FAVERSHAM.

WANTED, Situation as Works' Clerk. Three Years' at Local Gas-Works. Shorthand and Book-keeping. Good References.
Address C. B., 170, High Street, Watford, HERTS.

MANAGER or Distribution Superin- tendent is OPEN TO ENGAGEMENT. Fully qualified. Large experience in modern Works. Excellent References.
Address No. 4025, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO TAR DISTILLERS.
PRACTICAL Tar Distiller (age 29), desires engagement as MANAGER or ASSISTANT on a Tar-Works. Seven years with present employers as Assistant-Manager and Chemist. Thorough knowledge of the Manufacture of Products.
Address, No. 4023, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two second-hand Purifiers, in good repair. Size, about 9 or 10 feet square by about 5 feet, inside measurements.
State Price and give Full Particulars to SECRETARY, Gaslight Company, GIRVAN.

GOOD Working Manager wanted. State Wages required, Age, and Family. Cottage, Fire, and Light provided on Works.
Apply, by letter, to No. 4027, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Foreman wanted for the Broughty Ferry Gas Department. Must know the working of Regenerator Settings and the usual routine, and be able to handle a few men well, and look to Conveying Plant and West's Manual Stokers.
Particulars as to duties and wages may be had from
FORBES WADDELL,
Manager.

YOUNG Man wanted to Canvas for new orders and to ADVISE Customers on the use of Cookers, Fires, Incandescent Burners, &c. Will be required to do slight adjustments and repairs, and maintain Incandescent Burners. Permanency for suitable person.
Apply, by letter only, with Full Particulars of Qualifications, Salary required, &c., to the
MID KENT GAS COMPANY, Snodland, KENT.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE CEMENT PAINT, GAS COAL.
BALE & CHURCH, 5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

CLACTON URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)
WANTED, immediately, a thoroughly competent SERVICE LAYER AND FITTER. Age 25 to 30. Permanency to satisfactory man.
Apply, by letter only, stating Wages required, with *copies* of recent Testimonials, to the MANAGER, Town Hall, CLACTON-ON-SEA.

WANTED, a Carbonizing Foreman Must understand Regenerative Firing, and be capable of controlling Men. Eight-hour Shifts. Wages 45s. per week.
Apply, by letter, to the MANAGER, Gas-Works, COVENTRY.

WANTED, an Agent in London, Man- chester, and Scotland, to REPRESENT a well-known Constructional Engineering Firm. Only those who are in touch with requirements of Gas-Works, and are well-known in the respective districts, need apply.
Apply, by letter, to No. 4028, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Croydon Commercial Gas and Coke Company require the services of a CARBONIZING AND YARD FOREMAN, who must be under 45 years of age, and thoroughly experienced in the working of Regenerative Settings and in the management of Men.
Wages £3 per week, with House, Coal and Gas.
Apply, by letter, enclosing *copies* of recent Testimonials, to Mr. J. W. HELPS, Gas-Works, Waddon, CROYDON.

SKEGNESS GASLIGHT AND COKE COMPANY, LIMITED.
WANTED, a Manager and Collector for the above Company.
Applicant must have had thorough and practical experience in Gas Manufacture, Distribution, Main Laying, &c., and be able to keep Works' Books, make Reports, &c.
Salary £110 per annum; no House. Good opening for smart, energetic Man.
Present make about 9 million cubic feet per annum.
Applications, stating Age, Experience, present employment, and enclosing *copies* of recent Testimonials, to be sent to us not later than the 5th of June, 1903.
Canvassing will be considered a disqualification.
By order,
TWEED STEPHEN AND DASHPER,
Solicitors and Secretaries.
Skegness, April 27, 1903.

GAS-WORKS for Sale, in thriving con- dition, and paying good interest.
Apply, by letter, to No. 4026, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

FOR SALE—Four 9 feet square Puri- fiers, complete with 8-inch Centre-Valve, Connections, and Lifting Apparatus. In very good condition. Can work three or four Purifiers as desired. Can be seen at work.
For further Particulars, apply to J. DAVIES, Gas-Works, NANTWICH.

FOR SALE—Three 5-feet Square Puri- FIERS, in good condition. Complete with Centre-Valve, 5-inch Connections, and Lifting Screws for Cover.
Apply to the MANAGER, Gas-Works, Little Sutton, CHESHIRE.

FOR SALE—Two Purifiers, 6 feet square, and Two 6-inch FOUR-WAY VALVES, with all Fittings Complete; (2) Steel HYDRAULIC MAIN, 13 ft. by 18 in. by 18 in., U-shaped, suitable for two, four, or six Retorts, with Dip-Pipes and Cradles Complete (almost new); and (3) Old GASHOLDER, 12 ft. by 25 ft., with Three Columns and Fittings Complete.
Apply to the GAS MANAGER, Pitlochry New Gaslight Company, Limited, PITLOCHRY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Very good Gas Plant as under:—
PURIFIERS—Four 12 feet square, with 8-inch Centre-Valve and Connections. Planed Joints.
Kirkham WASHER-SCRUBBER, 300,000 cubic feet per diem, with Engine and 8-inch Valves and Connections.
Livesey WASHER, 250,000 cubic feet per diem, with 8-inch Valves and Connections.
Photos. sent on application to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

FOR SALE—
50 18-in. by 15-in. ∩ RETORT MOUTHPIECES, fitted with Tangye Patent Lids, 6-inch Outlets.
30 18-inch Round RETORT MOUTHPIECES, fitted with Tangye Patent Lids, 6-inch Outlets.
3 Lengths of Cast Iron HYDRAULIC MAIN, with 4-inch Outlet and Valves.
18 6-inch ASCENSION, ARCH, and DIP PIPES for above, with 50 feet of 8-inch FOUL MAIN and Connections complete.
1 8-inch Donkin VALVE.
For further Particulars, apply to G. M. ROBINS, Gas Offices, Sutton, SURREY.

BOROUGH OF LEIGH.

(WATER DEPARTMENT.)

THE Gas and Water Committee of the above Corporation invite TENDERS for the supply and delivery of about 3500 yards of 16-inch diameter Cast-Iron Socket and Spigot PIPES and SPECIALS.

Specification, Forms of Tender, and any further Particulars may be obtained on application to the Engineer, Mr. James Gibson, Gas and Water Works Offices, Leigh, Lancashire.

Sealed Tenders to be delivered to me the undersigned not later than Twelve o'clock noon on Saturday, the 16th day of May, 1903.

By order,
PEREGRINE THOMAS,
Town Clerk.

Town Hall, Leigh, Lancs.,
April 21, 1903.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to re- ceive TENDERS, on Forms to be obtained at the Office of the Gas and Water Manager, for the supply of Screened GAS COAL and CANNEL, for the Year ending the 30th of June, 1904.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon on Wednesday, the 13th day of May, 1903.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness,
April 23, 1903.

MANCHESTER CORPORATION GAS-WORKS.

WATER-TUBE CONDENSERS.

THE Gas Committee are prepared to receive TENDERS for the supply, delivery, and erection of Two WATER-TUBE CONDENSERS at their Rochdale Road Station.

Specification and Form of Tender can be obtained, in writing only, from Mr. C. Nickson, Superintendent, Gas Department, Town Hall, Manchester.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Condensers," must be delivered at the Gas Department, Town Hall, not later than Ten a.m. on Saturday, the 16th of May, 1903.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
May 1, 1903.

LIVERPOOL UNITED GASLIGHT COMPANY.

TENDERS FOR CANNEL AND COAL.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 30,000 Tons of CANNEL, and 220,000 Tons of COAL, to be delivered at the various Works of the Company during the period of Twelve Months, between the 1st of July, 1903, and the 30th of June, 1904.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Full Particulars and printed Forms of Tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom Tenders (on the printed Form only) must be delivered, at or before Ten a.m., on Saturday, May 16, endorsed "Tender for Cannel and Coal."

By order,
WILLIAM KING,
Engineer.

Gas Office, Duke Street,
Liverpool, April 15, 1903.

NEWHAVEN AND SEAFORD WATER COMPANY.

THE Directors of the above Company are prepared to receive, on or before Twelve o'clock noon of Wednesday, the 27th day of May, 1903, further sealed TENDERS for the purchase of the SHARES remaining unsold of the 500 Ordinary "B" Shares of and in the Undertaking of the above-named Company.

Particulars of Sale and Form of Tender may be had on application to the Secretary, Claremont Road, Seaford.

By order of the Directors,
JOHN T. BICKFORD,
Secretary.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board invite Tenders for the surplus TAR and AMMONIACAL LIQUOR which may be produced at the Accrington and Great Harwood Works of the Board, during the Year from the 1st of July next to the 30th of June, 1904.

The estimated quantity of Tar is 1800 Tons, and Liquor 5000 Tons.

Sealed Tenders, endorsed "Tar and Liquor," addressed to the Chairman of the Board, must be in my hands on or before Tuesday, the 12th of May.

Forms of Tender may be obtained on application.

By order,
CHARLES HARRISON,
General Manager.

General Offices, Accrington,
April 15, 1903.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company invite TENDERS for their requirements, as under, for the Year ending June 30, 1904—viz.,

GAS COAL and CANNEL, delivered at Wilmslow Station; GAS-METERS (Dry), GAS-COOKERS, BENZOL, and MACHINERY OIL, delivered at the Company's Works. Also CARTING for One, Two, or Three Years.

Particulars as to quantities required, copies of Specification, and Forms of Tender, can be had (in writing only) from the undersigned.

Sealed Tenders, endorsed "Tender for ——," must be sent not later than Tuesday, May 12, 1903, to W. H. Welsh, Esq., Secretary, 52, Brown Street, Manchester.

The Directors do not bind themselves to accept the lowest or any Tender.

WM. SEVERS,
Engineer and Manager.

Gas-Works, Wilmslow,
April 22, 1903.

COMMERCIAL GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 210,000 Tons of clean dry, unscreened, fresh-wrought GAS COALS, delivered f.o.b. to the Company's Steamers at any suitable Port, during the Year ending the 30th of April, 1904.

The deliveries to be in about equal monthly quantities throughout the Year.

Payment in cash monthly.

Parties desiring to Tender for more than One Year must state separately the price and quantity offered for each Year.

Particulars and Forms of Contract may be obtained from the Engineer, Mr. S. H. Jones.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Nine o'clock on the 11th of May.

Commercial Gas-Works, Stepney, E.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the Supply of COAL, COAL NUTS, and THROUGH and THROUGH CANNEL for Gas Making Purposes for a period of Twelve Months, commencing from the 1st of July, 1903.

Forms of Tender, together with any further Information, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Birkenhead.

Tenders (accompanied by copy of recent analysis), stating the price per ton, delivered on to the Gas-Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the Afternoon of Thursday, the 21st of May, 1903.

Also for the supply of STEAM COAL and SLACK (washed and unwashed), to be delivered at the Pumping Stations of the Spring Hill, Playbrick Hill, Borough Road, Mount Road, and the Ford Water-Works, for a period of Twelve Months, commencing from the 1st of July, 1903.

Forms of Tender, together with any further Information, may be obtained from Mr. J. W. M. Richardson, C.E., Assistant Water Engineer, Town Hall, Birkenhead.

Tenders, stating the price per ton delivered at the various Pumping-Stations, must be sent in to me, sealed and endorsed "Tender for Water-Works Coal," not later than Five o'clock in the Afternoon of Thursday, the 21st of May, 1903.

All deliveries to be made from time to time according to the requirements of the respective Engineers.

The parties whose Tenders may be accepted will be required to enter into a Contract containing a clause as to the payment of the rate of wages, and the observance of the hours of labour recognized and agreed upon between the Trades Unions and the employers in the locality in which the work for carrying out the contract is to be performed.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
May 1, 1903.

BOROUGH OF LONGTON.

(GAS AND ELECTRICITY DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Electricity Committee in- vite TENDERS for the purchase of their surplus TAR during Twelve Months ending June 30, 1904.

Sealed Tenders, endorsed "Tender for Tar," to be sent in addressed to the Chairman of the above Committee not later than Tuesday, May 26.

The Committee do not bind themselves to accept the lowest or any Tender.

W. LANGFORD,
Engineer and Manager.

May 1, 1903.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

WATER ORDER, 1902.

THE Directors of the above Company Hereby Give Notice that a SALE BY AUCTION of TWO THOUSAND NEW ORDINARY £5 SHARES in the above Company will, under and in pursuance of "The Borough of Portsmouth Water Order, 1902," take place at Messrs. Penney and Clark's Auction Mart, King's Road, Southsea, on Tuesday, the 16th day of June, 1903, at Seven o'clock in the evening.

The above Shares, which form part of the New Ordinary Capital authorized to be raised by the said Order, will be sold in Lots, of which the amounts and particulars (together with the Conditions of Sale) will be duly announced.

Dated this 30th day of April, 1903.

By order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.

Company's Offices: Commercial Road,
Portsmouth.

BOROUGH OF RICHMOND, SURREY.

(WATER-WORKS AND PUBLIC BATHS.)

TENDERS FOR SMOKELESS WELSH STEAM COAL.

THE Town Council of the Borough of Richmond, Surrey, invite TENDERS for the supply of about 1400 Tons of best WELSH SMOKELESS COAL, to be delivered in Barges of about 40 Tons alongside the Wharf opposite the Water-Works, Richmond, for One Year from the 1st day of July, 1903, and the 30th day of June, 1904.

The Seam and District from which the Coal is to be supplied must be stated in the Tender.

Particulars and Forms of Tender can be obtained of Mr. W. G. Peirce, Borough Water-Works Engineer, at the Water-Works.

No Tender will be recognized unless it is made on the prescribed Form, properly filled up in every respect, and no expenses or claim will be allowed or paid to any person whether tendering or not.

The security stipulated by the Public Health Act, 1875, for the due performance of the Contract and Bond will be prepared by the Town Clerk.

Sealed Tenders, endorsed "Tender for Welsh Coal," and addressed to the Chairman of the Water Committee, Borough of Richmond, Surrey, must be delivered at the Town Clerk's Office, by Ten o'clock on Monday, the 25th of May, 1903.

The Council do not bind themselves to accept the lowest or any Tender.

FREDK. B. SENIOR,
Town Clerk.

Town Clerk's Office,
Town Hall, Richmond, Surrey.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the Shareholders, at their Ordinary General Meeting held this day, have declared a DIVIDEND of 7 per cent. for the year ended December 31, 1902, of which 3 per cent. was distributed in October, 1902, by way of Interim Dividend, leaving the balance of 4 per cent. (8s. per Share) to be paid forthwith, free of Income-Tax; and NOTICE IS HEREBY FURTHER GIVEN to the Holders of Share Warrants to Bearer of this Company, that Coupon No. 26 is payable by the Company's Bankers, Prescott's Bank, Limited, 50, Cornhill, E.C., at the rate of 8s. per coupon. Coupons must be left with the Bankers three clear days for examination.

By order,
J. M. MACMORRAN,
Secretary.

1, East India Avenue,
Leadenhall Street, April 30, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £12,500 ADDITIONAL "B" CONSOLIDATED STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 12, at Two o'clock precisely, in Lots.

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From 3d. to 1s. PER HOUR and from 1 to 72¾ HOURS.

RISING

By SUCCESSIVE QUARTERS of an Hour as to Time and

By SUCCESSIVE FARTHINGS as to Money

While Farthings and Halfpennies are entirely eliminated.

Compiled by EDWIN DOWDING, Accountant.

THESE Tables have been compiled to meet a pressing want felt by those engaged in calculating Wages payable at hourly rates, and they are confidently recommended as being far more simple in their design than any other arrangement in vogue.

They contain, in a straightforward tabular form, every amount which can possibly be required at rates of from 3*d.* to 1/- per hour, and from 1 to 72¾ hours, rising by successive quarters of an hour as to time, and by successive farthings as to money. The ordinary form of Ready Reckoner, although at present largely used in default of anything better, for calculating Wages, is but ill adapted for that purpose, because such simply gives amounts payable for *whole* hours, whilst at the top of the page is shown fractional figures for quarter hours, half hours, and three quarters; therefore, before the total sum payable can be arrived at, it is necessary to add these two amounts together. This entails additional time and labour, besides the risk of inaccuracy, whereas by means of Dowding's Wages Tables, whatever the rate per hour may be, the exact sum payable is seen at a glance, side by side with the time, no calculation whatever being necessary.

Another great advantage is that farthings and halfpence are entirely eliminated, the principle upon which the calculations have been made being the one adopted by general usage, that is to say, in cases where the sum payable contains a farthing, the employer benefits,—the farthing being dropped,—but where it contains a halfpenny, or three farthings, the workman gains, the next penny being paid.

Further, in order to reduce the time requisite to find any given rate to a minimum, the book has been constructed in a handy Index form with each even rate, 3*d.*, 4*d.*, 5*d.*, and so on, clearly shown in such a manner that the particular page on which any required rate appears can be instantly turned to.

For simplicity, convenience, conciseness, and time saving in use, it is confidently claimed that these Tables cannot easily be surpassed, and there can be no doubt that they will prove extremely useful to all those firms, companies, corporations, &c., who employ any description of labour paid at hourly rates.

All the calculations have been made and verified with the utmost care, and the compiler has every confidence in their absolute correctness.

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"Journal of Gas Lighting."

"In those trades in which the workmen are to a large extent paid at hourly rates, the want has been felt of a ready reckoner specially suited for the calculation of the amounts to which they are entitled; the ordinary forms being ill-adapted for the purpose, mainly from the fact that entire hours only are dealt with. Mr. Edwin Dowding, an accountant, has supplied this want by compiling a series of tables showing the sums payable at rates ranging from 3d. up to 1s. per hour, and from 1 hour to 72¾ hours; rising by successive quarters of an hour as to time, and farthings as to money. Farthings and halfpennies are eliminated; but at the top of each page will be found the figures for the fractional parts of an hour. To facilitate the use of the tables, the rates per hour are printed in red on the outer margin of the paper, which is cut index fashion, so that the book can be opened quickly at the particular place required. The special value of the work is that the exact sum payable can be ascertained at a glance, without any calculation. The tables are printed on stout paper so as to stand handling."

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"This is an admirably arranged little book for saving the trouble of computing sums in wages paid by the hour. It gives in tabular form the amounts for hours and quarters of hours from 1 to 72, for wages from 3d. per hour to 12d. per hour, ascending by farthings. The whole numbers, 3d., 4d., 5d., &c., are printed in red on cut margins, as in a ledger, so that they can be turned to at once. The book ought to be very useful to those who frequently have to pay fractional wages or fractional times."

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"An excellent book of wages tables calculated for wages payable by the hour. These tables contain every amount required at rates of from 3d. to 1s. per hour, and from 1 to 72¾ hours."

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½		8	½	5	11	½	11	2	½	16	5	½	21	8	½	26	11
¾		9	¾	6	0	¾	11	3	¾	16	6	¾	21	9	¾	27	0
2		11	14	6	2	26	11	5	38	16	8	50	21	11	62	27	2
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¾	1	3	¾	6	6	¾	11	9	¾	17	0	¾	22	3	¾	27	6
3	1	4	15	6	7	27	11	10	39	17	1	51	22	4	63	27	7
¼	1	5	¼	6	8	¼	11	11	¼	17	2	¼	22	5	¼	27	8
½	1	6	½	6	9	½	12	0	½	17	3	½	22	6	½	27	9
¾	1	8	¾	6	11	¾	12	2	¾	17	5	¾	22	8	¾	27	11
4	1	9	16	7	0	28	12	3	40	17	6	52	22	9	64	28	0
¼	1	10	¼	7	1	¼	12	4	¼	17	7	¼	22	10	¼	28	1
½	2	0	½	7	3	½	12	6	½	17	9	½	23	0	½	28	3
¾	2	1	¾	7	4	¾	12	7	¾	17	10	¾	23	1	¾	28	4
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¼	2	4	¼	7	7	¼	12	10	¼	18	1	¼	23	4	¼	28	7
½	2	5	½	7	8	½	12	11	½	18	2	½	23	5	½	28	8
¾	2	6	¾	7	9	¾	13	0	¾	18	3	¾	23	6	¾	28	9
6	2	8	18	7	11	30	13	2	42	18	5	54	23	8	66	28	11
¼	2	9	¼	8	0	¼	13	3	¼	18	6	¼	23	9	¼	29	0
½	2	10	½	8	1	½	13	4	½	18	7	½	23	10	½	29	1
¾	3	0	¾	8	3	¾	13	6	¾	18	9	¾	24	0	¾	29	3
7	3	1	19	8	4	31	13	7	43	18	10	55	24	1	67	29	4
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10	4	5	22	9	8	34	14	11	46	20	2	58	25	5	70	30	8
¼	4	6	¼	9	9	¼	15	0	¼	20	3	¼	25	6	¼	30	9
½	4	7	½	9	10	½	15	1	½	20	4	½	25	7	½	30	10
¾	4	9	¾	10	0	¾	15	3	¾	20	6	¾	25	9	¾	31	0
11	4	10	23	10	1	35	15	4	47	20	7	59	25	10	71	31	1
¼	4	11	¼	10	2	¼	15	5	¼	20	8	¼	25	11	¼	31	2
½	5	0	½	10	3	½	15	6	½	20	9	½	26	0	½	31	3
¾	5	2	¾	10	5	¾	15	8	¾	20	11	¾	26	2	¾	31	5
12	5	3	24	10	6	36	15	9	48	21	0	60	26	3	72	31	6
¼	5	4	¼	10	7	¼	15	10	¼	21	1	¼	26	4	¼	31	7
½	5	6	½	10	9	½	16	0	½	21	3	½	26	6	½	31	9
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By order of the Directors of the
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NEW ISSUE OF £3000 CONSOLIDATED ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 26, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £5464 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, May 26, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

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SALE BY AUCTION OF 250 £10 ORDINARY SHARES

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The Water Revenue has risen from £14,226 in 1897 to £17,765 last year.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, the 12th of May, at Two o'clock, in Lots, by order of the Directors.

Particulars of Sale, with Form of Instructions for the Auctioneer or Secretary to purchase for Investors unable to attend the auction, obtainable post free of the SECRETARY of the Company, GREAT YARMOUTH, or of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LOWESTOFT WATER AND GAS COMPANY.

SALE BY AUCTION OF 400 ADDITIONAL ORDINARY £10 SHARES.

Ranking for 7 per cent., the Dividend on similar Shares in the Company having been 5¾ per cent. for several years past; also

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MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, May 26, at Two o'clock, in Lots, by order of the Directors.

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Particulars of Sale, and Form of Instructions for the Auctioneer or Secretary to purchase for Investors unable to attend the Auction, obtainable post free of the SECRETARY of the Company, 137, London Road, LOWESTOFT, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

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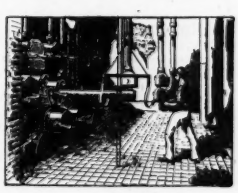

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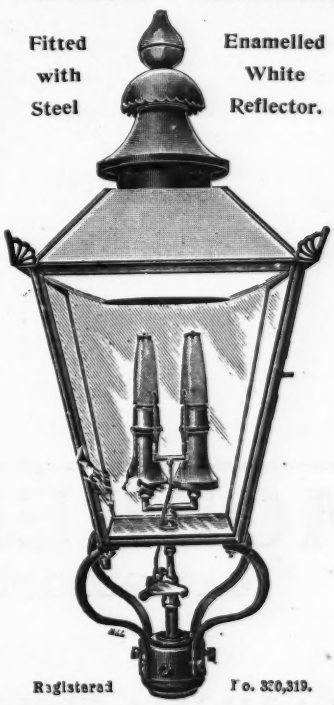

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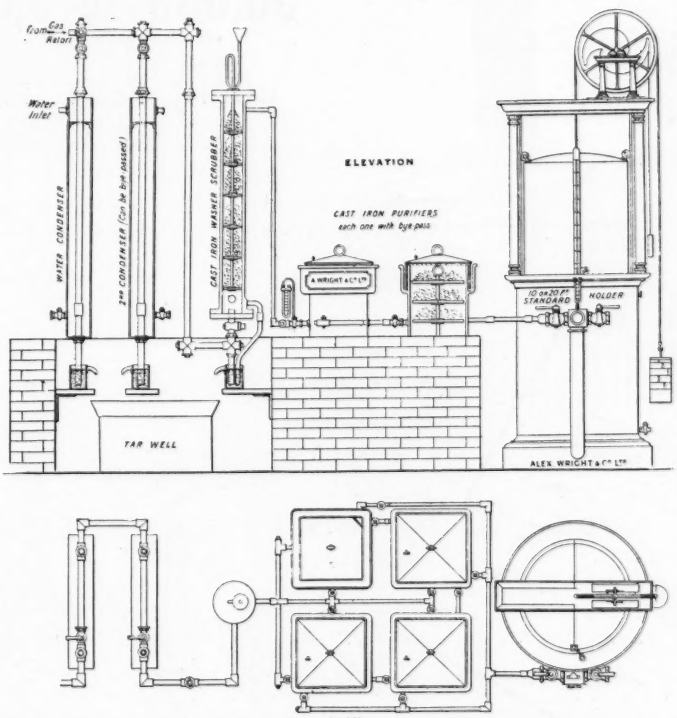

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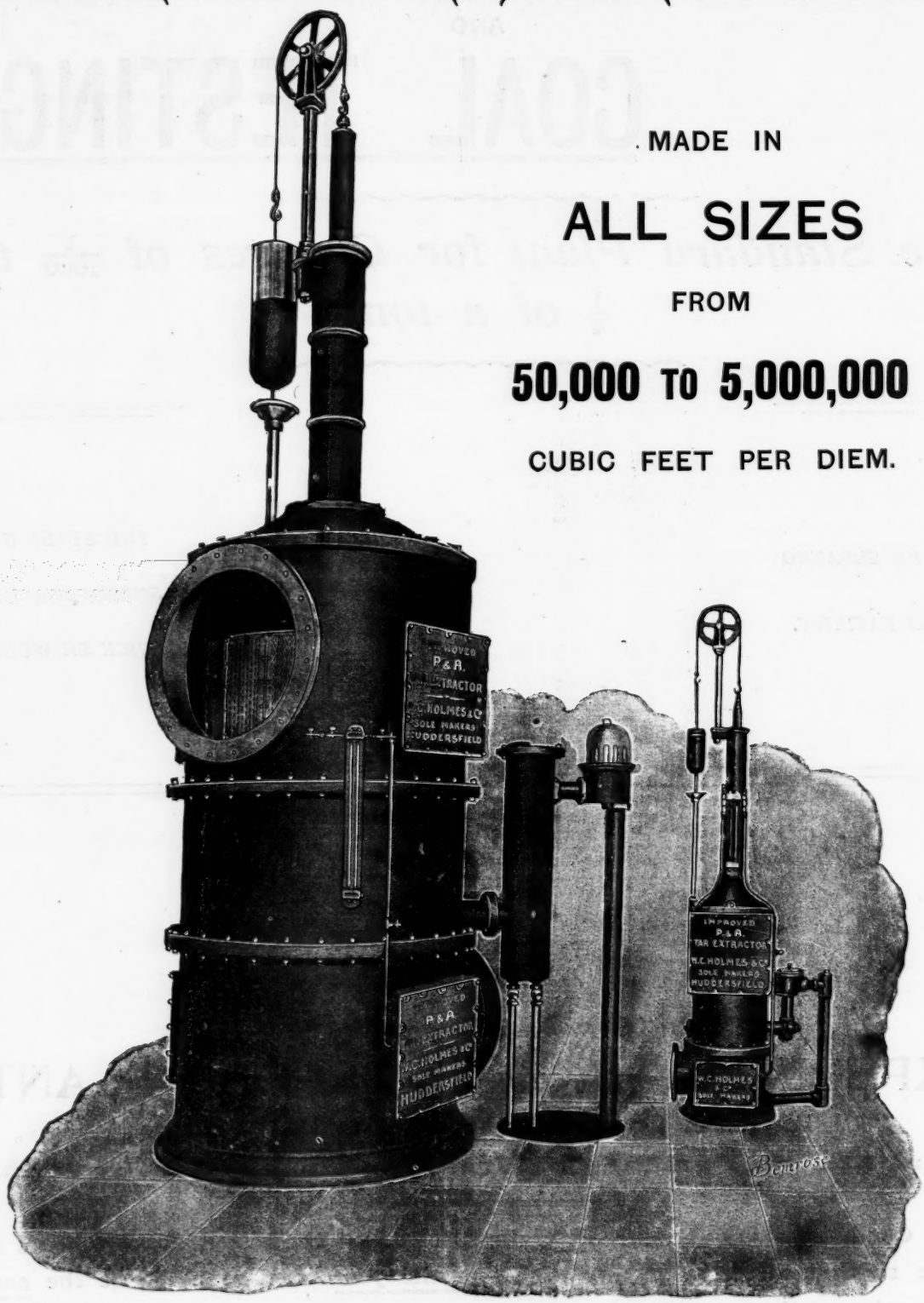

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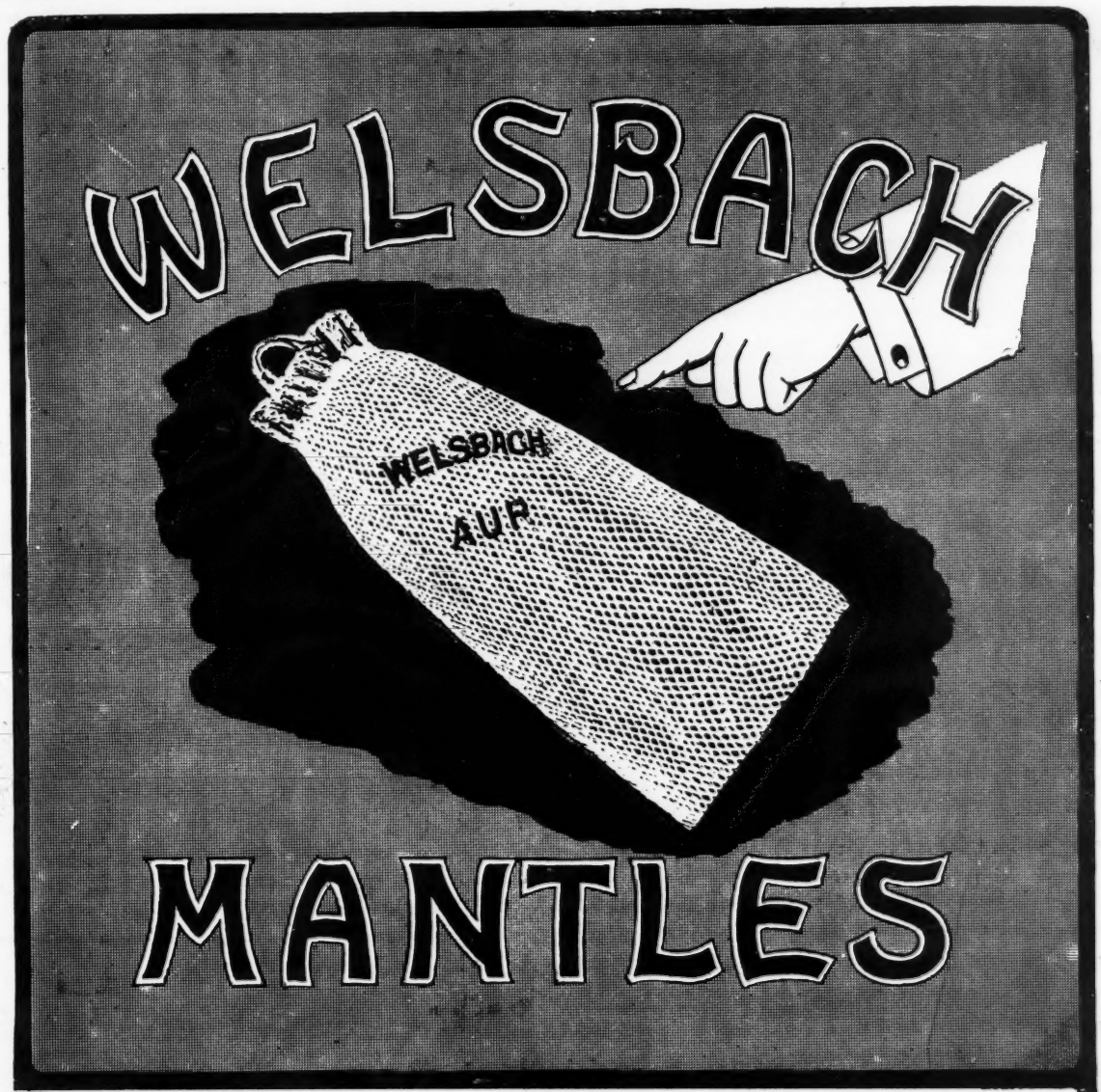

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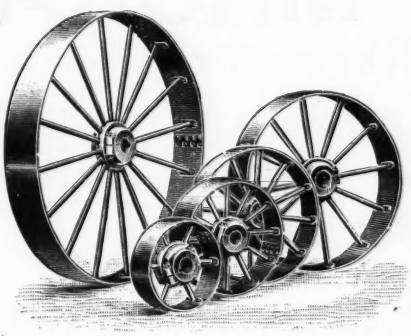

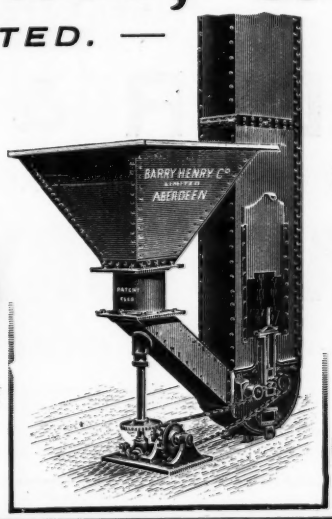

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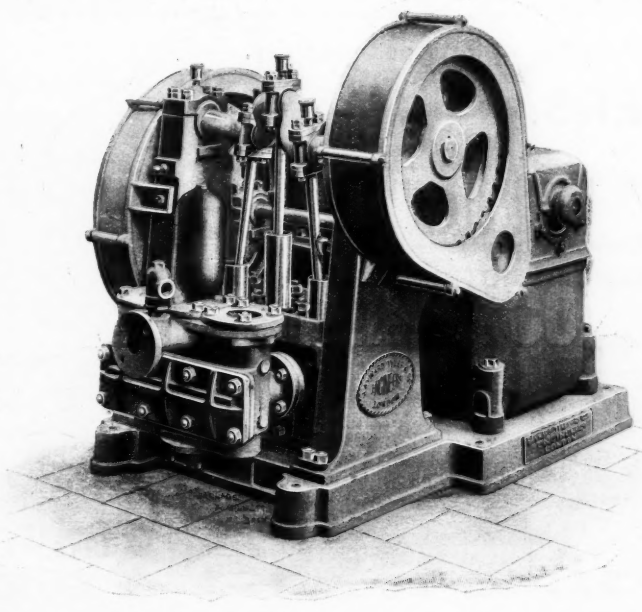

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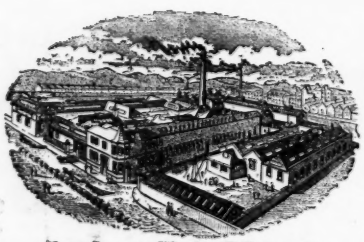

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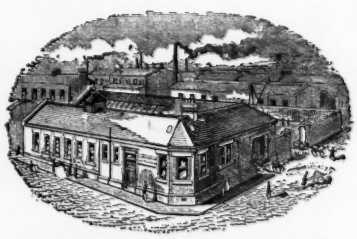

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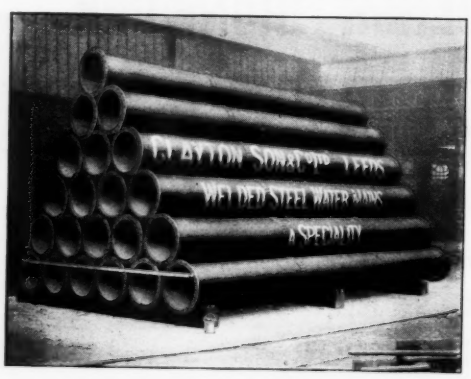

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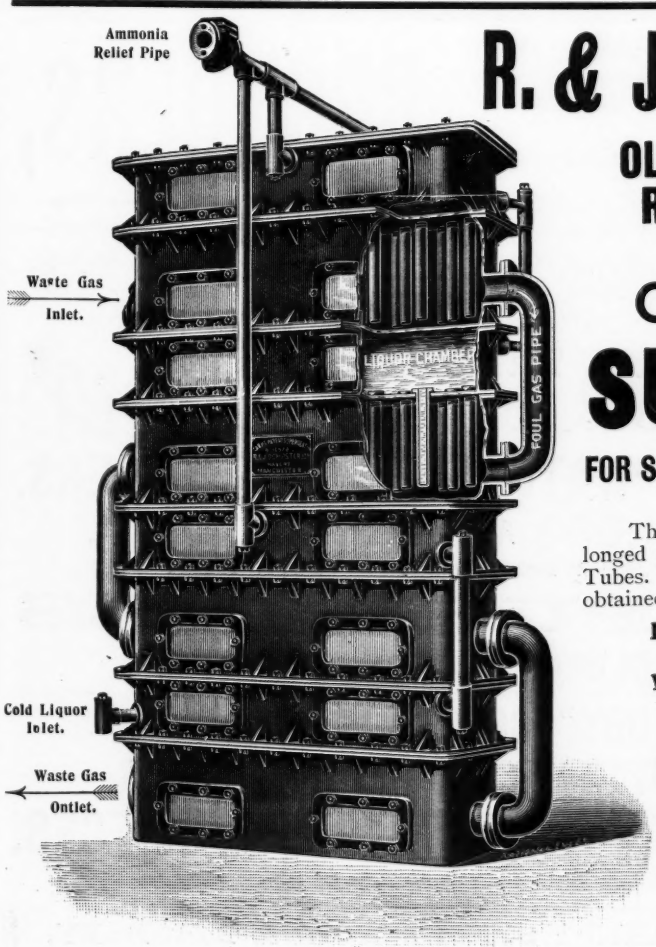

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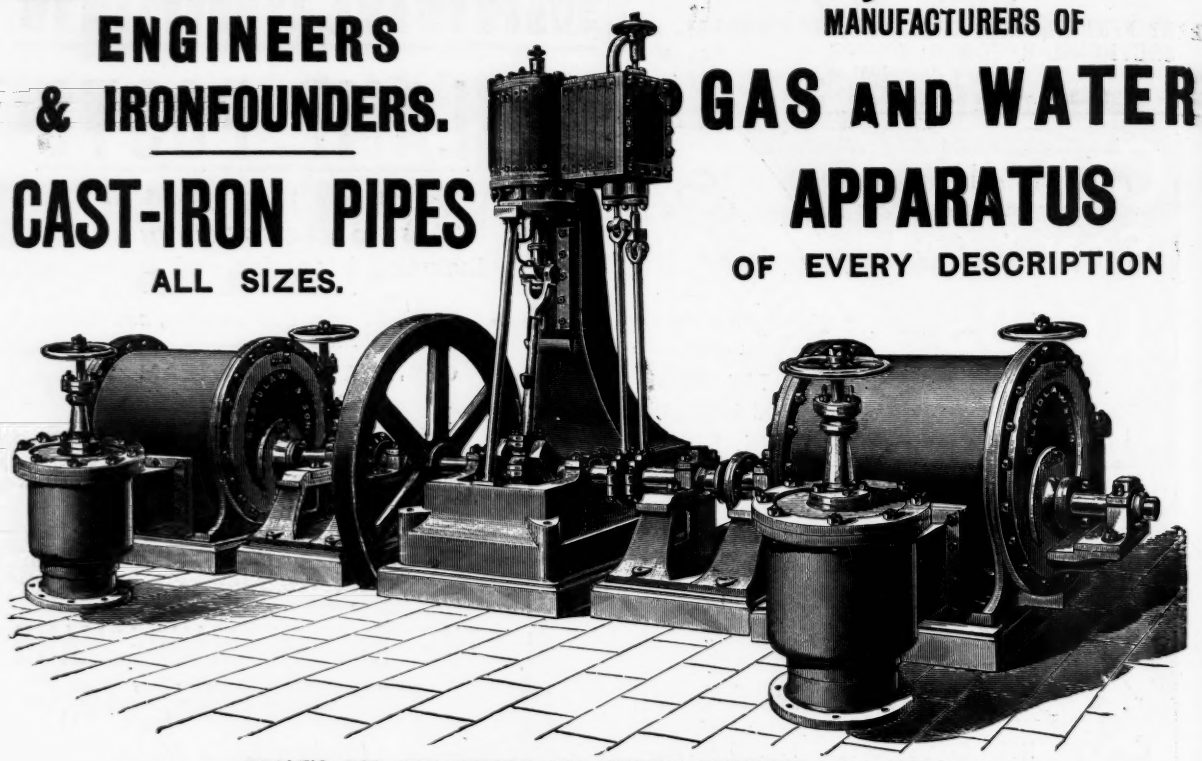

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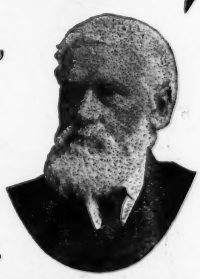

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